ABSTRACT

How is Safety-II Being Applied in Practice and is it Working?

by

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After a safety incident occurs, most organizations react deliberately to investigate exactly what happened and why. Safeguards and corrective actions are put in place that will minimize its chance for recurrence. Those deemed responsible are held accountable and injured parties are given appropriate medical treatment. Additionally, successful safety performance is measured by the absence of those injuries and incidents. These traditional methods used to analyze outcomes and for measuring safety performance remain focused on what has gone wrong, as opposed to analyzing what usually goes right and the number of intended and acceptable outcomes in everyday activities is as high as possible. This is the main premise of Safety-II, also known as the New View of safety. This thesis researches Safety-II methodology and its success by those who have adopted it, and contrast it against the traditional (Safety-I) approaches commonly used today. The safety professionals that contributed to this research were all selected because of their endeavors in instilling these methodologies. These individuals either work directly for large, global commercial or governmental enterprises, or serve as consultants. All have many years of practical experience in managing occupational safety and demonstrated a high level of commitment to creating and sustaining a safe workplace. Their responses to the questions posed to them all acknowledge the benefit that implementing the tenents of Safety-II has had on their

respective organizations, not only in terms of safety, but also of profitability, morale and a more productive and engaged workforce.

How is Safety-II Being Applied in Practice and is it Working?

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by

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INTRODUCTION

Safety is nearly always defined as a condition where nothing goes wrong (injuries, accidents/incidents/near misses) or more cautiously as a condition where the number of things that go wrong is acceptably small. One consequence of this is that safety management relies on metrics that measure the absence of safety rather its presence. Because the focus is on things that go wrong, there will be something to measure when safety is absent, but paradoxically nothing to measure when safety is present (Hollnagel, 2014).

These words lead to Hollnagel's (2014b) concept of Safety-II. The main premise of Safety-II is that as much as possible goes right and safety is celebrated when things go right, not just when nothing goes wrong. Analogous to resilience, Safety-II is defined as the ability to succeed under expected and unexpected conditions alike, so that the number of intended and acceptable outcomes in everyday activities is as high as possible.

One concern with this concept comes from an article written by Andrew Hale where he discusses his view of Safety-II and states that safety practitioners and their leadership are too willing to follow safety intervention fashions and to accept anecdotal evidence that something will work, rather than asking for that more rigorous level of proof to raise the probability that their investment will be worthwhile. He cites an example of the difficulties a researcher finds while attempting to quantify safety by what goes right in a manufacturing environment (Hale, 2014).

Hale raises a valid question. If an organization wants to measure safety success by what goes right, then how is that done and what specifically is measured? When Hollnagel (2014) published his book *Safety-I and Safety-II*, there were organizations already embracing and applying these concepts in their day to day business activities. This author's organization was

having much success with managing safety proactively, although still measuring success by what didn't go wrong. Since that time, others began and are well along on the Safety-II journey. In the pages that follow, the ideas behind Safety-II, also known as the New View (Ball et al., 2015) of safety will be outlined and then followed by details of interviews with those who have implemented Safety-II concepts. In doing this, it will offer insight for those managing safety in the traditional methods that Hollnagel defines as Safety-I.

RESEARCH QUESTIONS AND SYNOPSIS

Erik Hollnagel's concept of Safety-II aims to offer tools and techniques that improve safety performance, focus on why most of the time things go right, and utilizes the talents of an organization's workforce to have a broader impact. However, guidance on actually how to implement Safety-II is limited. At the time of this research development, Hollnagel (2017) published a textbook entitled "Safety-II in Practice". This thesis will research those techniques as well as interview recognized health and safety practitioners that have implemented Safety-II to determine if the efficacy of the concept is improving safety. The results here will complement Hollnagel's book and will aid other practitioners seeking to implement these new ideas in practice. Specifically, this thesis will explore, describe, and critique how Safety-II methodologies are being adapted into practice and if these methodologies are effective in improving overall workplace safety.

Using this research and interviews, this thesis will answer the following research questions:

- How do organizations implement Safety-II?
- How do organizations obtain buy-in from their leadership and employees?
- What tools and techniques are used in daily practice?

- How is the success of Safety-II measured?

This topic was one of the main premises for the *Applied Safety Management* (Safety 6402) graduate course taught by David Borys at East Carolina University. His guidance and expert knowledge on this topic was crucial in developing the list of safety and health practitioners that were interviewed and the open ended questions they were asked using the Interpretative Phenomenological Analysis (IPA) method. In IPA studies, participants are assumed to be subject experts, and accordingly the interview schedule should allow ample opportunity for them to tell their stories, and have the flexibility to delve into novel areas with the goal of producing richer data (Smith et al., 2007).

Additionally, snowball sampling techniques were also used in the course of the interviews in order to identify additional resources that have successfully implemented Safety-II. Snowball sampling is a method of non-probability sampling where the respondents are themselves used to recruit further respondents from their social networks. This method is often used where no sample frame exists and the population of interest is a hard-to-reach group (Elliott et al., 2016).

David Borys holds a Masters and PhD in Occupational Health and Safety from the University of Ballarat in Victoria, Australia. He serves as: adjunct Associate Professor of RMIT University, Melbourne, Victoria, Australia; as a Teaching Assistant Professor, East Carolina University, Greenville, North Carolina, USA; and as an Ad Hoc Graduate Faculty, University of Alabama at Birmingham, USA. He has published numerous articles on risk and safety management and has worked closely with Erik Hollnagel on the Safety-II concept and its development. He also enjoys a close relationship with Sydney Dekker whose work on safety and human factors is heavily referenced in this thesis.

LITERATURE REVIEW

Why Safety-II?

As defined in the introduction, Safety-II is a condition where as much as possible and ideally everything, goes right. It can also be defined as the ability to succeed under expected and unexpected conditions alike, so that the number of intended and acceptable outcomes is as high as possible. Things go right because we try to make them go right. We understand how they work and try to ensure that they have the best possible conditions to continue to do so. The starting point is a focus on success. Safety management must be proactive and make adjustments before an incident occurs. For this to work, it is necessary to foresee what can happen with acceptable certainty and to have the people and resources to do something about it. This requires an understanding of how the system works, how its environment develops and changes and how functions depend on and interact with each other (Hollnagel, 2014).

In Safety-II, the purpose of an incident investigation is understanding how things that usually go right, occasionally go wrong and that adverse outcomes are an unexpected combination of everyday performance variability. It is therefore necessary to understand how such everyday activities go well and succeed in order to understand how they fail (Hollnagel, 2014).

The human workforce that organizations rely upon to produce their goods and services are viewed as a resource for flexibility and resilience, not as a liability or hazard. Human performance variability is inevitable, but also a useful tool that should be monitored and managed, not prevented or viewed as hazardous.

So why pursue this view of safety? The primary reason is that many practices of traditional safety have been used to or beyond their breaking point. This is not to say that these

methods have not been successful. Injury statistics from 1994 to 2015 show that workplace fatalities have decreased approximately 27% (USDOL Bureau of Labor Statistics, 2015). However, if we are to move beyond current performance levels, then the time has come to add a Safety-II perspective and adopt resilience engineering practices (Hollnagel, 2014).

The inevitability of human error

According to Conklin (2012), the average skilled worker makes five to seven errors per hour. That same research states that a knowledge worker, those who work with ideas and concepts makes between 15 and 20 errors per hour. Errors are a natural part of being human. Human error is inevitable, all workers commit them. What this means is that error is everywhere, and nothing can be done to avoid the errors. Errors cannot be punished or rewarded away. Conklin states also that error is an unintentional, unpredictable event and safety practitioners have to make sure that the organizational managers remember that fact. This is not an easy task. Error is always attributed in retrospect to the worker by the organization after some type of incident occurred, and is usually seen as a moment in time where the worker did something wrong. If the worker had done something other than what they actually did, the incident could have been avoided.

Human beings do not seek to work without making errors. We seek to achieve a satisfactory result while minimizing negative costs, not wasting time, or creating a safety incident. A worker's key objective is to make progress toward their goals while remaining cognitively in control of the situation. According to Amalberti (2013), seventy percent of incidents have a human cause related to operator errors, and the natural reaction is that if errors can be reduced, it will lead to a reduction in safety incidents. However, the reality of this is not

quite so simple. There are several observations to this. As mentioned above, human beings make several errors every working hour, but these are mostly self-detected and corrected. They are inherent in routine cognitive function and cannot be eliminated. Lastly, the excessive and erroneous simplification of the link between errors and safety has not to any large extent resolved the questions of safety.

Unfortunately, the frailties of individuals are seen as an inherent source of risk. They tend to undermine the engineered and managed features of already safe systems and consequently are viewed as a managerial problem (Dekker, 2015). The error itself never causes the risk of the incident. What leads to an incident is the result of losing control and awareness of the compromises between acceptable risks and the ability to manage the situation (Amalberti, 2013).

Consider embracing instead the concept that our knowledge comes largely from our discoveries and experiences. Our experiences are meaningful relations and this is what perception is made up of. Our being is characterized by continual transactions between knower and known. By acting in the world, people continually create environments that constrain their interpretations and consequently their next possible action. So what this creates is different rationalities and understandings of the situation, none of which are right or wrong, better or worse, but coupled directly to the interests, expectations, knowledge, and goals of the observer. To truly understand why someone did what they did, we must put ourselves in their situation and realize what they knew and understood at the time (Dekker, 2015).

Human performance and its variability

Human performance variability can occur for numerous reasons. It can be due to various physiological and psychological phenomena, such as bodily and mental fatigue or a dislike of monotony. It can be due to more complex psychological phenomena like ingenuity and self-realization, including that people like to make things better, to be creative or efficient, or that they are trying to conserve resources to guard against undefined future developments. Other reasons are socially induced variability, like trying to meet other's expectations, complying with informal work standards such as speed and quality, or trying to help – or hinder – others. Additionally, organizationally induced performance variability, as in meeting demands, stretching resources, resolving ambiguity and double binds can be the reason why. Lastly, it can be due to contextually induced performance variability in the ambient working conditions, such as noise, humidity, vibration, or temperature (Hollnagel, 2012).

The adjustments of tasks and activities to match actual working conditions will always be approximate and incomplete. There are two fundamental reasons for that: a lack of information and a lack of time. The lack of information is due to the simple fact that the underspecification that makes the adjustments necessary means that some information is missing. If complete information had been available when the work situation was specified or designed, then there would, in principle, be no need to adjust the work when it was carried out. Adjustments are needed precisely because information is incomplete, and this incompleteness themselves must be approximate.

Humans and organizations are multi-modal, in the sense that their performance is variable across several levels. Human performance is sometimes better than the norm, sometimes worse, and on occasion even worse than the low or unacceptable limits in some way. However,

human performance never fails completely. A human 'component' cannot stop functioning and be replaced in the same way a technological component can (Hollnagel, 2012).

See work from the point of view of those actually performing the task – work-as-imagined versus work-as-done

When describing and understanding why things work and why actions succeed, those actually doing the work know that it is only possible to work by continually adjusting what they do to the situation (work-as-done). But the same work looks quite different when seen from those supervising or further up the organization. Here there is a tendency to emphasize work as it should be done (work-as-imagined), When seen from the point of view of those doing the work, it is obvious that work-as-done is, and must be, different from work-as-imagined. The reason is because it is impossible for those further up the organization to anticipate all the possible conditions that can exist. Seen from the worker's point of view, it is no surprise that descriptions based on work-as-imagined cannot be used in practice and that actual work is different from prescribed work. From those above the worker, this difference is not at all easy to see, partly because it is seen from the outside and from a distance, partly because there is a considerable delay and partly because any data that might exist have been filtered through several organizational layers. Instead, they assume that there is no difference between work-as-imagined and work-as-done. When a difference between the two is found, the difference is conveniently used to explain why things went wrong (Hollnagel, 2014).

The space between planned work and performed work creates an operational gap. In that operational gap is a vast amount of valuable information about safety, as it exists in those operations. This is very different from what is learned by observing worker behavior or auditing

procedural use and adherence. This is the reality about what happens when work is being done. It is very important to seek understanding here in order to know how to better plan work the next time this or similar tasks are performed. Plans are made for safety by a pre-job activity in the following ways: hazard identification by job hazard analysis (JHA) and job safety analysis (JSA), followed by training and qualification. However, all of this is done for the job that we imagine the workers do. It is now understood that real operational learning comes from understanding the difference between work as planned and work as done. The problem with all this work our workers do is the lack of knowledge your organization has about the actual work environment. As workers adapt and improvise solutions, new dangers are also being discovered. In this environment of discovery, workers are faced with hazards that were not planned for, mitigated for, or protected for (Conklin, 2012).

Getting this information can be done in several way. Conklin (2012) offers that the best way to discover this information is to ask for it by doing post-job reviews of successful work. Asking workers the following four questions which requires a small amount of time and effort will start to provide this operational information, and reinforce a knowing culture: 1. what happened the way you thought it would happen? 2. What surprised you? 3. What hazards did we identify and what hazards did we miss? 4. Where did you have to "make do," improvise or adapt?

A more elaborate method is using Hollnagel's (2012b) Functional Resonance Analysis Method (FRAM). The FRAM is a method for modelling complex socio-technical systems, which is well-suited for capturing the essential characteristics of work-as-done. Most methods for work analysis, including risk and safety analyses, are based on a model. The purpose of these methods is to describe the target performance in the model language which essentially means

that the target performance is mapped onto the model. The FRAM, however, is not based on a specific model of how work takes place but is rather used to produce a model that describes the functions that together make up the performance as well as their mutual dependencies.

An example of this involved two intensive care units, one in Australia and one in Denmark that were modelled and analyzed using the FRAM (Clay-Williams et al., 2015). The FRAM was used to guide collaborative discussion with healthcare professionals involved in writing and implementing the guidelines and to ensure that the final instructions were compatible with other workplace processes.

What resulted were processes that would have impeded implementation were discovered early, and the guidelines were modified to maintain compatibility with current work processes. Missing process elements were also identified, thereby, avoiding the resulting confusion had the originally written guideline been introduced. Using the FRAM to reconcile differences between work-as-imagined and work-as-done when implementing a guideline can reduce the need for clinicians to adjust performance and create workarounds which may be detrimental to both safety and quality, once the guideline is introduced (Clay-Williams et al., 2015).

Employees are part of the organization's success, empower them to have ownership in the process

According to Siegel (2016), almost three quarters of all workers are not genuinely committed to their employer. This commitment starts at the top of the organization. Executives and senior management must learn how to release power, resources and responsibilities to better motivate their employees. The reward for this is an engaged employee base where all members

are committed to achieving individual and organizational goals, performing at their personal best, and motivated toward the organization's success.

Employees who feel confident to make decisions and take action will mirror good leaders. Empowering people at all levels of the organization is the route to improving organizational results. Many studies have found that organizations with empowered employees have higher customer satisfaction, tend to be innovative, and have high market-share while experiencing much lower turnover. The reason is that their employees enjoy their jobs.

Everyone wants to feel valued and appreciated. Sincere thanks and leadership recognition is usually worth more than extra financial compensation. One of the most effective ways to empower employees is to solicit their ideas and suggestions. Organize self-directed work teams that encourage contributions from and delegate responsibilities to each team member, and cross-train staff to promote knowledge sharing. Lastly, conduct regular employee surveys to check the organizational pulse (Siegel, 2016).

Enable and encourage employees to voice their opinions and offer suggestions for new processes or procedures. Delegation of responsibilities is one of the best ways for empowering people, and it helps leadership to have time to focus on the bigger picture.

Delegation doesn’t occur for many reasons. Some leaders have a lack of trust in their team. Others seek perfection and need control. This is unfortunate because most everyone wants to grow and become more valuable. The more employees can tangibly contribute to the success of the organization, the better they feel about themselves. Empowered employees see

challenges. Engage and empower them to take ownership and feel they are part of the team (Siegel, 2016).

From a safety perspective within the nuclear power field, research about leadership and its relationship to safety performance found that participative management (communicating and giving feedback to subordinates) was positively associated with safety performance. Some leadership techniques, such as stimulating certain styles, considering them individually and rewarding them, were found to foster leaders` impact on workers' safety behaviors. In a nuclear power plant, a study assessed the impact of an empowering leadership style on the perceived safety behavior of employees. Focusing on individual leadership, they found that leaders' empowering behaviors such as leading by example, participative decision making, interacting with employees, and others enhanced perceived safety behaviors through their influence on safety climate (Martínez-Córcoles et al., 2012).

Workplace rules as support and expert guidance. Recognize and respect the expertise of those actually doing the work

In a world viewed by organization leaders, a logical solution to reduce or eliminate performance variability would be to standardize work and constrain performance variability for peak efficiency and to avoid malfunctions and failures. This is accomplished by rigorous training and drills, barriers, interlocks, guidelines and procedures, rules and regulations, supervision, and standardized data and interfaces.

Forcing employees to stick to rules can lead to ineffective, unproductive, or even unsafe actions. For some jobs, following the rules and getting the task done are mutually exclusive (Dekker, 2015).

Actually, the ability to make performance adjustments is essential to understanding work-as-done (Hollnagel, 2014). People do not always follow procedures. Work, especially in complex, dynamic workplaces, often requires subtle, local judgments for timing of subtasks, relevance, importance, and prioritization (Dekker, 2003). Looking at this in terms of rules management, it is found that in most organizations, rules are thought of as the best way to carry out activities, covering all known contingencies. They are devised by experts to guard against the errors and mistakes of fallible human operators, who are more limited than the experts in their competence and experience. In actuality, the real experts are the operators whose ability to navigate rules is seen as an essential part of their skill and identity. When attempts are made to impose outside rules, it usually results in the use of informal, group rules, which are seen as violations by those on the outside, but as skilled adaptations by those on the inside. To take advantage of our employees' inevitable variability in the day to day execution of their tasks, rules should be seen as a support and guidance for the expert, not something requiring strict compliance and certainly not a substitute for competence. This can be symbolized by re-labelling rules as 'guidelines' or as 'resources for action' (Hale et al., 2013).

This does not simply mean that employee's adaptations of rules can be done without oversight. Unmonitored adaptations can sacrifice system goals, miss constraints or vulnerabilities. The gap between rule and task needs to be appropriately bridged by those that regulate as well as the operator. The regulator must understand exactly what the implications are when imposed in practice. They both must partner together to resolve the mismatch (Dekker, 2015).

To put this in context, a safe workplace cannot be achieved by strict adherence to rules. It is the result of the worker's insight into the details of a situation that demand certain actions and

them being skillful in finding and using the resources at their disposal (including written procedures) to accomplish their goals. Procedures cannot by themselves guarantee safety. Safety results from people being skillful at judging when and how (and when not) to adapt procedures to the circumstance at hand (Dekker, 2015).

Encourage and incentivize incident reporting as a learning tool

According to Probst (2015), there are numerous characteristics related to injury underreporting, including employee demographics, organizational tenure, fear of work-related reprisals or loss of incentives, job insecurity, and employee preconceptions regarding acceptable occupational hazards and injuries.

Safety climate might play a role in accident and illness reporting. Organizational safety climate has been defined as "a unified set of cognitions held by workers regarding the safety aspects of their organization". Since then, this definition has been refined to indicate that there are several important dimensions to consider when conceptualizing and measuring safety climate. These include the extent to which management places a high priority on safety, an atmosphere where there is an open exchange of information regarding safety, the extent to which training is accessible, relevant, and comprehensive, and where safety procedures are perceived to be effective in preventing safety incidents. Recent analyses have demonstrated that safety climate is related to workplace accidents and injuries, safety compliance, safety motivation, and safety knowledge.

There are several reasons to expect that organizational safety climate will also be predictive of employee underreporting of workplace safety incidents. First, if there is inadequate or incomplete safety training and communication, employees may not know what constitutes a

reportable incident or how to report that incident to their organizations. Additionally, if employees think their managers do not value safety, they may assume that their organizational leaders would prefer not to hear about injuries when they occur. Finally, organizations that dole out rewards and punishments contingent upon safety outcomes rather than safety behaviors may foster safety systems that encourage underreporting (Probst, 2015).

Probst (2015) indicated that many of these factors might be related to employee reporting attitudes. It was found that an unresponsive managerial reaction or lack of concern was the largest predictor of intentions to underreport by train conductors. Another researcher argued that employees would be less likely to report near-misses if they felt managers lacked commitment to safety or actively discouraged reporting. Also, overly burdensome reporting procedures and subsequent incident investigations might serve to inhibit reporting. Although suggestive of a relationship between climate and underreporting, much of the early work in this area has operationalized underreporting by measuring employee attitudes toward reporting, rather than estimates of incident reporting itself. In a systematic investigation of the reasons for underreporting, it was found that the most frequently endorsed reasons employees gave for not reporting workplace incidents pointed to a poor safety climate, specifically thinking nothing would be done to fix the problem, that the incident was unimportant, or that there would be negative consequences for reporting. Moreover, individuals with more negative perceptions of their company's safety climate had higher numbers of unreported incidents. Based on this initial work, it appears that safety climate may play a role in explaining why individuals choose not to report incidents to their supervisors.

What goes unreported goes unfixed. Therefore there are significant consequences of incident underreporting for employees and the organizations they work for. Employees who underreport may not receive the medical care they need to address their injuries or their entitled workers' compensation. Additionally, fellow coworkers may be at higher risk of experiencing similar injuries if the occupational hazards are not investigated and resolved (Probst, 2015).

Creating a safety climate where regular reporting of safety incidents is difficult. Having management commitment is recognized as probably the single most important factor for success in any area of occupational safety, and presumably in any organizational change. This especially applies for top management commitment, but also line management's commitment is also an important factor in changing the safety behavior of workers (Nielsen et al., 2006).

Effective near-miss reporting is an extremely valuable tool in identifying and subsequently correcting a safety issue before it results in an injury. Establishing an environment where this is effective requires resolving all of the aforementioned hindrances and building a significant amount of trust within the organization and a commitment that the reported incidents are effectively acted upon. The ratios of near-misses to injuries varies widely from 50 to 300 to 600 near-misses for every injury depending on the research. There have been identified six items that must be done in order to have an effective incident reporting system:

1) Top management is visibly committed to the process.

2) Middle management is actively involved in the program.

3) Supervisor performance is focused.

4) Hourly employees are actively participating.

5) System is flexible to accommodate site culture.

6) System is perceived as positive by the hourly workforce (Williamsen, 2013).

Investigate incidents from the point of view of those doing the work using non-linear processes to see what normally goes right, has gone wrong

Safety incidents can be viewed as the result of a sequence of events. This linear way of conceptualizing the interaction of events to produce a mishap was put forth by Heinrich in 1931 and is still commonplace today. This model puts forth that events preceding an incident occur linearly, in a specific order, resulting in the incident itself as the last event. It has been referred to as the domino model, depicting an incident as the last in a line of falling dominoes. Consistent with this idea of a linear chain of events is that of a root cause. This can also be viewed as a trigger that sets everything in motion. This is a pervasive idea, even if multiple parallel or converging sequences are occasionally depicted trying to capture some of the greater complexity of the incident precursors. This idea forms the basic premise in many risk analysis methods and tools such as fault-tree analysis, probabilistic risk assessment, critical path models and more. Also consistent with a chain of events is the concept of barriers, defined as a separation between the source of hazard and the object or activity that needs protection. Barriers can be visualized as blockages between dominoes that prevent the fall of one affecting the next, thereby stopping the chain reaction (Johannesen et al., 2012).

In sequence-of-events analyses, a cause-consequence equivalence is assumed where each effect is also a cause, and each cause an effect, but also a symmetry between cause and effect. This has become an assumption that we often take for granted in our consideration of incidents. People may take for granted a symmetry between cause and effect. For example, that a very big effect, such as number of fatalities, must have been due to a very big cause such as egregious

errors. However, this model is blind to patterns about cognitive systems and organizational dynamics. People only appear as an additional step that determined a branch or continuation of the sequence underway. Human performance becomes a discrete, binary event, the human did or did not do something, which either failed to block the sequence or allowed the sequence to continue that resulted in the eventual outcome. With this mindset, the outside observer can easily construct alternative sequences, "the incident would have been avoided or prevented if only those people had done X instead of Y." (Johannesen et al., 2012).

It is important to try to capture and understand all the things that are happening to set up failure. To do this one must look both at the (linear) timeline of the event (which is not at all truly representative of reality), and at the same time look at the complex relationships that exist between all the many moving parts that had to align to result in failure (Conklin, 2012).

How managers react or respond to an operational failure matters greatly. Leaders must know that they play an enormous role in how the learnings of an event develop. Managers will need to know what to do.

One study suggests that it is important to examine how employees understand learning from incidents. While individual learning, as well as learning related to immediate causes of incidents are important, there should also be an emphasis on learning about the precursors and the need to integrate findings into organizational documents, to not only facilitate continued improvement, but also sharing between departments and other facilities. This shows the importance of the structure and content of learning activities, both for those who manage incidents and those who are tasked to apply the lessons learned (Vastveit, et al., 2015). A possible solution would be to assign a learning agent, who is responsible for efforts to learn from incidents. Though engineers and other technical resources have excellent system and process

knowledge and understanding, they may benefit from additional training that addresses how incidents should be understood, and how measures should be developed to deal with precursors and events leading up to the incident (Vastveit, et al., 2015).

Conklin (2012) in his book *Pre-Accident Investigations* developed a card which asks managers to be aware of both their reactions and responses, and suggests some better alternatives to ask when confronted with an event. Nine things managers should ask first and in order when they are notified that something unexpected happened:

1. Your response to an event matters!
2. Are the people OK?
3. Is the facility safe, secure, and stable?
4. Tell me the story of what happened?
5. What could have happened?
6. What factors led up to this event?
7. What worked well? What did not work?
8. Where else could this happen?
9. What else do I need to know about this event?

It was found that managers want to ask the right questions. When managers actively try to gather explanations and stories, and not reasons and causes, they started to get decidedly different, much higher quality reporting of events. With a better understanding came better responses and better solutions. At his organizations, they not only dropped the number of incidents, but also their severity.

In an increasingly large number of incident cases it is difficult or impossible to explain what occurred as a result of known processes or developments. The outcomes are therefore said

to be emergent rather than resultant. Emergent outcomes are not additive, not decomposable into 'components' and, consequently, not predictable from knowledge about such 'components'. In other words, investigative methods of linear causality will not effectively uncover these causes. In the case of emergent outcomes the causes are, however, elusive rather than real. The final outcomes are permanent or leave permanent traces, in the same way as resultant outcomes. The outcomes must furthermore be recognizable not only when they occur but also for some time afterwards. But the same need not be the case for whatever brought them about. These outcomes may be due to transient phenomena, combinations of conditions, or conditions that only existed at a particular point in time and space. These combinations and conditions may be explained by other transient phenomena. With emergent outcomes, the causes represent patterns that existed at one point in time but which did not leave any kind of permanent trace. As a result, the outcomes can therefore not be traced back to specific components or functions (Hollnagel, 2014).

Emergent outcomes can be understood as arising from unexpected and unintended combinations of performance variability where the governing principle is resonance rather than causality. This means that all the performance adjustments may be within an acceptable level or magnitude even though the outcome may be so large that is noticeable. The lack of proportionality between the precedents and the resulting consequence is one reason why emergent outcomes are described as non-linear. Since emergence cannot be explained in terms of causality, another explanation is needed. One principle put forth by Hollnagel (2014) is the idea of functional resonance. The FRAM discussed earlier maps the couplings or dependencies among the system functions as they develop in a specific situation.

According to Tian et al. (2016), most recent accidents are the outcome of emergent properties when multiple aspects interact within socio-technical systems, as opposed to the result

of a single aspect. The traditional safety engineering approaches, including the ones discussed in the next section are becoming more and more limited in their ability to explain how multiples causes resulted in a safety incident. The FRAM focuses more on the understanding of interactions and emerging phenomena in the complex socio-technical systems of today.

The FRAM is applied by identifying functions with detailed information about how something is done, characterizing the function's variabilities, interpreting possible coupling of this variability and generating suggestions for managing it. Traditional systems focus on the "how", while the FRAM attempts to answer the "why" (Tian, et al., 2016). In other words, the FRAM does not identify what can go wrong or the probability of failure, but develops the description of what may happen during a typical work activity (Rosa, et al., 2015).

Identify and manage risk proactively

Safety management needs to be proactive. For this to work, it has to be able to foresee what can happen with acceptable certainty and have the appropriate means in terms of people and resources to do something about it. The main points of the traditional view of safety which Hollnagel defines as Safety-I and the contrasting view of Safety-II are put forth in Table 1.

Table 1: A Comparison of Safety-I and Safety-II (Hollnagel, 2014).

	Safety-I	Safety-II
Definition of safety	As few things as possible go wrong.	As many things as possible go right.
Safety management principle	Reactive, respond when something happens, or is categorized as an unacceptable risk.	Proactive, continuously trying to anticipate developments and events.
Explanation of accidents	Accidents are caused by failures and malfunctions. The purpose of an investigation is to identify causes and contributory factors.	Things basically happen in the same way, regardless of the outcome. The purpose of an investigation is to understand how things usually go right as a basis for explaining how things occasionally go wrong.
Attitude to the human factor	Humans are predominantly seen as a liability or hazard.	Humans are seen as a resource necessary for system flexibility and resilience.
Role of performance variability	Harmful, should be prevented as far as possible.	Inevitable but also useful. Should be monitored and managed.

The primary method is to always identify the risks in each system and establish an ideal model of defenses. The tools used to evaluate risk are well known to most safety practitioners and the appropriate tool to be used depends on what stage your system is in: from a conceptual perspective or attempting to analyze processes that have already resulted in an incident. For the former there are process and functional analysis such as Failure Mode and Effect Analysis (FMEA), Failure Mode Effect and Criticality Analysis (FMECA), Preliminary Risk Analysis (PRA), Hazard and Operability Study (HAZOP), and Hazard Analysis Control Critical Point (HACCP). For the latter there are various in-depth analysis methods and tree based techniques such as Fault Tree Analysis, Event Tree Analysis, and Management Oversight Risk Tree (MORT) (Amalberti, 2013). A word of caution with some of these tools, especially the latter

ones. They can suffer from the same limitations listed above in terms of linearity and breaking the incident down into smaller components (Amalberti, 2013). Moreover, Hollnagel (2012b) warns that these traditional system safety tools are warranted for technical systems, but not suitable for socio-technical systems, including accident analysis nor risk assessment. An acronym that Hollnagel et al., (2009) coined - WYLFIWYF (What-You-Look-For-Is-What-You-Find) points out the well-known fact that the data we find depends on what we look for, which in turn depends on how we think of and describe the reality we work with.

The second step is to set the model that has been analyzed alongside the real situation. In a lot of these circumstances, operators do not follow this model. Divergences occur for different reasons which will eventually lead to safety incidents. It is important and useful to understand why these occur. Do not make the usual mistake of assuming that the model is always correct and force the operator to comply by adding stronger defenses or procedures. Allow yourself to question the model's fundamentals (Amalberti, 2013).

The third step is systemic and a follow-on to the previous. As mentioned earlier, no one should believe that a complex system can be made safe by relying on procedures and recommendations and forcing the front-line operator's compliance. Another strengthening step needs to be taken based on a strategy of "safe governance". Involve the actions of top and middle management on how to conceive a safe structure and the relationships between the specific interests of each directorate, division, branch and subcontractor as well as each body and profession within those groups. One technique the author's organization successfully used was a design review process for each new or modified equipment change. There are many available techniques for this process. It requires the interaction of all those involved to ensure that as safe a process as possible was achieved when the system deployed.

Focus on success instead of avoiding failure

Safety management's nature clearly depends on the definition of safety. Since Hollnagel defines Safety-I as 'a condition where the number of adverse outcomes is as low as possible', the purpose of safety management is to achieve just that.

Reactive safety management can work in principle if events do not occur so often that it becomes difficult or impossible to take care of the actual work. In other words, it works if responding to adverse events does not interfere with the primary activities. However, if the frequency of adverse events increases, the need to respond will sooner or later require so much capacity and time that the reactions become inadequate and will partly lag behind the process. Under these conditions the system will not have sufficient time to recover from the response and return to the normal levels of productivity. In practice, it means that situational control is lost and with that the ability to manage safety effectively.

Another consequence of the Safety-I perspective is that safety and the core business of production are seen as competing for resources. Investments in safety are seen as necessary but unproductive. Safety managers may sometimes find it hard to justify or sustain these. Senior organizations and boards often find it hard to understand the importance of investments in safety, especially if there have been no serious incidents for a period of time or if capital costs have to be recovered (Hollnagel, 2014).

This monetary attitude to safety can be viewed as justifiable. Investing in increasing compliance and in building additional barriers and defenses which do not directly contribute to production is a cost. The conflict between safety and productivity is very real in Safety-I. This is an additional reason to change the safety perspective. Safety-I is reactive and protective because it focuses on what has or could go wrong. It is usually controlled by various forms of restriction

and compliance. However, work requires flexibility and variability, and consequently safety may find itself in conflict with an organization's attempts to improve productivity. Those responsible for investments that are used to improve safety may sometimes consider whether there will be a negative impact on productivity, but not whether they could actually improve productivity (Hollnagel, 2014).

As was stated in the introduction, Safety-II is defined as the ability to succeed under expected and unexpected conditions alike, so that the number of intended and acceptable outcomes in everyday activities is as high as possible. It can be difficult to perceive things that go right because it happens all the time and there is not a readily available vocabulary or set of categories by which to describe this situation.

In safety management, the non-event is far more important than the event. It is more important that things go right than that things do not go wrong. The two states are not synonymous, the reason being that they are the result of quite different processes. Things go right because we try to make them go right, because we understand how they work, and try to ensure that they have the best possible conditions to continue to do so. Things do not go wrong because we prevent them from going wrong by focusing on the causes. In the former case, the starting point is a focus on successes, the Safety-II view, while in the latter it is a focus on failures, or the Safety-I view. In Safety-II the absence of failures is a result of active engagement. This is not safety as a non-event, because a non-event can neither be observed nor measured. Safety-II is marked by a presence of successes, and the more there are, the safer the system is. In other words, safety is something that happens, rather than something that does not happen. Because it is something that happens, it can be observed, measured, and managed.

Safety-II explicitly assumes that systems work because people are able to adjust what they do to match the conditions of work. Workers learn to identify and overcome design flaws and functional glitches because they have the ability to recognize the actual demands and adjust their performance accordingly, and because they interpret and apply procedures to match the conditions. Workers can also detect and correct when something goes wrong or when it is about to go wrong and intervene before the situation becomes seriously worsened. The result of all this is performance variability, not in the negative sense where variability is seen as a deviation from some norm or standard, but in the positive sense that variability represents the adjustments that are the basis for safety and productivity (Hollnagel, 2014).

Develop a resilient organization that can quickly recover from setbacks

Resilience is the ability of a system to recognize, absorb, and adapt to disruptions that fall outside of its design base. Resilience is also about enhancing people's adaptive capacity so that they can recognize and counter unanticipated threats. Adaptive capacity with regard to a narrow set of challenges can grow when an organization courts exposure to smaller dangers, which allow it to keep learning about the changing nature of the risks it faces. This allows it to forestall or being able to absorb larger dangers. Resilient systems are effective at meeting threats that represent infinite reconfigurations of what the industry anticipates. They are capable of maintaining process integrity well outside the base design, training, and procedures.

Organizational resilience comes from a set of capabilities: recognizing the boundaries of safe operations; steering back from these boundaries in a controlled manner; and recovering from a loss of control when it does occur (Dekker, 2015).

Resilience is not about heroics or individual courage from the frontline workforce. Resilience in terms of safety is a presence of capacities, capabilities, and competencies to make things go right. This is what helps make safety the presence of these traits of resilience instead of the absence of things not going wrong. This is about identifying and enhancing the positive capacities of people and organizations that allow them to adapt effectively and safely under varying and resource-constrained circumstances. The most important sources of knowledge and expertise for this comes not from the top down, but from the bottom up. There is no substitute for deferring to technical and operational expertise. This is a commitment to seeing the workforce as a resource and a solution to harness, not as a problem to control.

Competencies that are recognized as important for the establishment of resilience are found in high-performance and high-reliability organizational literature. These include communication, coordination, problem solving, and management of unanticipated and escalating situations. The research shows that high-performance teams and resilient organizations are those that develop and harness people's competencies and capabilities. They build on opportunity, diversity, and positive capacities to make things go right.

What resilience tries to do is give people the freedom and opportunity to keep an active discussion about risk going even when everything appears safe. Regular meetings about what did not go well as well as what did are fundamental to highly dynamic operations and high performing teams. Additionally, allow real possibilities to say no when balancing production pressures with safety concerns. This is accomplished by creating relationships of trust and confidence up and down the organizational hierarchies that respect operational expertise. Lastly, create an environment where honesty and learning is possible, and the frontline workforce has

the opportunity to tell their side of the messy, intimate details of what it takes to get work done under conflicting goals and constrained resources (Dekker, 2015).

Measuring safety performance by proactive metrics

When major failures occur, thorough independent analyses point out that warning signs were missed. This result derived over many incidents and industries can be captured in a short phrase: “The past seems incredible, the future implausible”.

One powerful example is the 2003 Columbia space shuttle accident where the independent accident board highlighted how NASA had discounted warnings that foam debris strikes during launch were a significant safety of flight risk requiring new analysis and replanning. The diagnosis however, went much further, noting that the accident was due to holes in the organization’s decision making processes. The board’s investigation revealed how NASA failed to balance safety risks with intense production pressure to be “faster, better, cheaper”. This pattern was combined with other patterns that can recur in accidents: a fragmented distributed problem solving process that was missing cross check mechanisms and unable to see the big picture. This resulted in an organization that could not see its own blind spots about risks (Gehman, 2003). Columbia and other examples of organizational incidents emphasize the need to monitor and manage risk continuously throughout a system’s life cycle. In particular, they need to find ways to monitor and maintain a balance between safety and the often considerable pressures to meet goals of production, quality, and efficiency (Woods, 2009).

Future resilience, as discussed previously is assessed by examining how the organization and its constituent activities and functions adapted to past disruptions or changes, what sources

supplied that adaptive power, and what are the trends and types of disrupting events being experienced. The result is a characterization of how well operational systems are prepared to handle different kinds of challenges and events that may arise in the future.

Therefore, resilience has the critical properties needed for metrics that can support anticipation and foresight: a parameter that estimates what can happen in the future based on data or patterns that are available from the immediate past. An orientation toward resilience does not assess adherence to procedures in operations. Instead it looks for gaps between the procedure system and the variations, uncertainties, events and complicating factors that can arise to challenge procedural work. The search for how an organization is resilient requires one to look beyond conformance to standards and norms that management believes govern behavior in order to see how people demonstrate expertise beyond these norms. In other words, how they anticipate bottlenecks and risks in order to be prepared to deal with them, should they in fact arise. It once again leads us to consider people not as a source of uncontrolled variance but as one normal source for local adaptive action which usually makes a system work despite these gaps (Woods, 2009).

Once information about how and where an organization is resilient can be generated and tracked, it can be used to supply the missing control feedback for proactive safety management that NASA sought following its accidents. Organizations can use this control signal to assess how resilience is changing. For example: are buffers being depleted? Are margins becoming more precarious? Are processes becoming more rigid? Are demands of the organization becoming tighter? Organizations can examine how these challenge events are changing and test if the needed adaptive capacity to handle these changes is present. If not, then they can make

targeted resource investments to increase system adaptive capacity in critical areas despite omnipresent pressures for productivity. Proactive safety is managing and regulating an organization's adaptive capacities as it evolves relative to its changing environment.

Can a philosophy of resilience be turned into specific measures and indicators for organizational decision making prior to incidents? Organizations must look at themselves in relation to their environment and determine the basic sources of resilience their system requires. Can they be made more adaptive, or not? Under certain circumstances, are they at risk of declining? The best example that organizations can manage and regulate their resilience comes from studies of utilizing cross-checks. Cross-checks are collaborative functions that contribute to system resilience. Used effectively, one unit provides feedback about the viability or possible gaps in another's plans, decisions, or activities. An organization can monitor the effectiveness of cross-checks to detect erroneous plans as has been done in studies of collaborative work or following incidents. The success of crew resource management, a safety strategy in aviation, which is now migrating to other areas of operations such as surgical teams, may be largely due to improvements in cross-checking (Woods, 2009).

To put this another way, organizations can proactively manage their risk by spending time and resources identifying, correcting, and where possible eliminating hazards before they result in a safety incident. This author's former employer made tremendous use of risk identification in many forms and all employees were expected to participate not only in the identification, but the resolution of this risk as well.

The most common example of this was reporting of, and where possible resolution of safety observations. Safety observations are any static situation or condition that had the

potential to result in injury or damage. These could be as simple as exposed wiring or a pothole in the parking lot or driveway. The number of reporting observations as well as the percent resolved was a key reporting metric. Beyond these, risk identification and resolution took on an increasing level of robustness from job safety/hazard analysis, periodic audits by management and staff, risk assessments, design reviews, and process safety methodology. All of these provided input for proactive metrics which were reported alongside the OSHA-mandated reactive measures.

Conklin (2012) at the end of his book *Pre-Accident Investigations* outlines four things that organizations should do well in terms of safety and could easily form the basis for how they could measure safety success:

1. **We are fixated on where the next failure will happen**. Like all good organizations, good companies never want to be surprised by failure. These companies are constantly looking in the field for areas that are confusing, super-risky, or high pressure, and places that "just don't feel right." These companies know that they will not predict the next event, but they can predict environments where events and failures are most prone to happen. The trick is that when they find a place they believe warrants their attention, they give that job site their attention.
2. **We constantly strive to reduce complicated operations**. Good companies do complex work, it is just that they have learned how to do complex work in uncomplicated ways. There is no doubt that you could walk through your job sites and find terribly complicated processes, procedures, instructions, rules, and methods. You must ask yourself, "Does this operational complication make work easier to do?

Or is this complicated system serving some part of the organization other than the worker?" We found that we were writing our procedures and work control documents to avoid compliance failure, and not to contribute to the performance of the mission. Systems and operations usually start out with the worker in mind, but as time goes by your rules and processes drift towards information about maintaining compliance, not about maintaining production.

3. **We respond to low level signals seriously**. I will never forget what the vice president said to me about this third principle. He called me from his office. During our conversation, I could just imagine him sitting behind his desk, feet up on the edge of his file drawer, phone headset in his ear. "Todd, we learned that when a field supervisor calls and says we have a problem that could get bigger if we don't fix it, that is the moment to drop your pencil, get in the truck, and drive out to that site. That's our emergency. That's when we react emotionally. That is when we make the biggest difference. That is our job now: we go out there, and fix the problem." There is not much I can add to that, other than to say he is right.
4. **We respond to events deliberately**. Finally, when something fails— and something will fail, even the best companies have failure— good companies respond deliberately. The construction company made a conscious decision that they would respond to failure deliberately. They don't get emotional; they don't go out to fix the worker. They don't enact immediate policy and rule change. They slow down and learn. Companies that are proficient at driving change in safety performance know that the only way that change can ever happen, the only way events are prevented, is through learning.

Celebrating what is accomplished to make workplaces safer as opposed to when nothing goes wrong

A common marquee in front of many industrial facilities is one that states: "XX days since our last recordable injury", or "YY million hours worked since our last lost time accident". The problem with this type of reporting is that no matter how good the record is, one day that number is going to instantly drop to zero. It could take several months or in some cases a year or more, but eventually it is going to happen. The probability of an injury in a complex, resource-constrained environment simply rules out zero (Dekker, 2015). At this author's former employer, that marquee was replaced by one that stated how many safety observations had been reported for that month, with a year-to-date count as well. The facility had a monthly quota for safety observations and all employees were expected to contribute toward that goal. The facility still had the occasional recordable injury. As many details as possible were communicated to the workforce regarding that injury, investigations were conducted, and corrective actions were mandated. However, the safety record was not rolled back to zero. In spite of an unfortunate injury, all employees were still doing their part to create and maintain a safe workplace and the number of reported safety observations continued to increase. Everyone knew that while we had sustained an injury, their efforts more than likely had prevented a second, third, or even fourth from occurring. Year-end celebrations for safety were held based on these and other proactive measures, and the fact that the facility had a lower number of recordable/lost time injuries than the previous year was not ignored but also was not the sole basis for celebrating safety.

Within a proactive culture, department and facility goals are established. These objectives focus on improving key elements of the safety system and fostering active employee involvement. Injury and illness reduction goals establish clear objectives, strategies and

measures. Safety and health goals are aligned with the company goals, upper management is monitoring progress and conducting periodic reviews. Accomplishments and milestones are recognized and celebrated.

Proactive recognition for group safety and health performance is based on system measures such as high audit scores or job safety analyses. Recognition for these contributions to helps ensure continuous improvement of the safety system-and drives down safety incidents and associated costs (Earnest, 1997).

METHODOLOGY

The purpose of this research is to specifically explore, describe, and critique how Safety-II methodologies are being adapted into practice. As mentioned in the Research Question section, David Borys' assistance was utilized in the identification of the interview subjects. This was primarily based on his personal experiences with these individuals and the work each have done in contributing to the body of knowledge on this topic.

As mentioned previously, David Borys holds a Masters and PhD in Occupational Health and Safety from the University of Ballarat in Victoria, Australia. He has served as: adjunct Associate Professor of RMIT University, Melbourne, Victoria, Australia; as a Teaching Assistant Professor, East Carolina University, Greenville, North Carolina, USA; and as an Ad Hoc Graduate Faculty, University of Alabama at Birmingham, USA.

The list of candidates to interview is outlined in Appendix 1. Access to the actual names and titles is restricted to the Thesis Committee and Institutional Review Board in order to maintain confidentiality. These were recommendations provided by David Borys and Michael Behm as individuals in the field of safety and health who have extensive experience in implementing Safety-II either at their own organizations or those who were their clients. The safety professionals that contributed to this research were all selected because of their endeavors in instilling Safety-II methodologies. There were four candidates recruited in the course of the interviews using snowball sampling as described previously (question #11). These individuals either work directly for large, global enterprises, or serve as consultants. Most of these individuals have advanced academic degrees, three are doctoral candidates, and four have doctoral degrees. All have many years of practical experience in managing occupational safety and demonstrated a high level of commitment to creating and sustaining a safe workplace.

Eleven of the thirteen reside in the continental United States and two reside in the United Kingdom.

Of the eighteen individuals identified and solicited, thirteen agreed to be interviewed, one declined due to being unable to secure approval from their chain of command, and there were four non-responses to the author's solicitations.

Once contact was established and the individuals agreed to be interviewed, they were individually surveyed via an interactive web-based conferencing tool (WebEx). They were asked the open-ended questions (which were provided in advance) listed below to determine how Safety-II is implemented, and if it is working well and sustainable at their respective organizations or clients, and how safety and health practitioners are operationalizing this. As mentioned previously, all participants' identities will be kept anonymous and are identified below only by their respondent #. A generic profile is also included as Appendix 4.

The semi-structured interviews were transcribed and analyzed using the qualitative analysis method of Interpretative Phenomenological Analysis (IPA). The thirteen individuals listed in Appendix 4 is an appropriate number for IPA because this method works best with small sample sizes (Fade, 2004). Moreover, there are few practitioners actually implementing Safety-II in practice, thus the purpose of this thesis. The analysis process of IPA is not just a single step process, it must include the following: (a) transforming information from what is unique to an individual into what is shared among all participants, (b) movement from narrative of experience to interpretation of experience, (c) commitment to understanding the experience from the participant's point of view, (d) creating a psychological meaning based focus within a specific research context (Cooper et al., 2012).

In IPA studies, participants are assumed to be subject experts, and accordingly the interview schedule consisting of approximately one hour of pre-work and at least one hour of interactive dialogue allowed ample opportunity for them to tell their stories, and have the flexibility to delve into novel areas with the goal of producing richer data (Smith et al., 2007). All of the interviewees gave freely of their time in the interest of providing a complete a picture as possible. IPA is a qualitative methodology that rejects the behaviorist methodology of examining people and instead focuses on first-person accounts to determine the meaning of an individual's experience. Researchers employing IPA can examine an individual's view of the world and successfully learn how that person understands his or her experience. These insights have proven beneficial for policymaking (Smith et al., 2009).

In IPA studies, participant numbers vary from one to thirty. According to one study, the largest number of transcripts included in an analysis was forty-eight. This study notes that sample size depends on a number of factors and that there is no 'right' sample size. With this method, small sample sizes are the norm in IPA as the analysis of large data sets may result in the loss of 'potentially subtle inflections of meaning' and a consensus towards the use of smaller sample sizes seems to be emerging. Accordingly, the thirteen individuals who participated in this survey is appropriate (Brocki, et al., 2006).

Transcriptions were recorded and analyzed for overall themes that reoccur during the interviews. The study was approved the East Carolina University and Medical Center Institutional Review Board (UMCIRB) and is attached as Appendix 1.

SURVEY QUESTIONS

As discussed, enabling Safety-II in an organization allows it to focus on safety success versus avoiding failure. Safety is measured in what it achieves instead of when something goes wrong. Proactive endeavors and a work environment where all employees contribute to process improvement becomes the norm. As this research is exploratory, the interview questions were developed as guide for the interview, and the interviewee was encouraged to engage in a discussion rather than a strict answer questions in a given time frame. The following open-ended questions provided to the survey participants will provide broad answers to demonstrate that the efficacy of this concept.

1. How did you sell your leadership on the idea that Safety-II was the necessary process to improve safety?
2. As the S&H Professional in your organization, what did you do to get started implementing Safety-II?
3. Do you feel that your upper management, as well as your management peers are on board with Safety-II and are they actively assisting you?
4. How are your employees empowered to have a voice in their day to day activities?
5. What tools and processes do you provide to ensure your employees' success when they go out to perform their tasks?
6. How do you measure and attempt to close the gap between work-as-imagined and work-as-done (one of the most challenging questions in discussions with David Borys)?
7. What tools do you use to implement Safety-II and how do you perform risk analysis? Additionally, do you use or have you considered using Functional Resonance Analysis

Method (FRAM), Resilience Assessment Grid (RAG), or Appreciative Analysis query as part of your risk assessment tools?

8. How do you measure safety success? How has this affected injury rates in your organization?
9. When do you feel the need to "refresh" safety in your organization?
10. What would you recommend for someone coming behind you? In other words, what would you do differently if you were just starting out?
11. Are there others that you recommend who have enjoyed success implementing Safety-II?

RESULTS

The following summarizes the overall themes from the responses to the interview questions. Complete transcripts of the respondents' interview can be found in Appendix 5.

1. **How did you sell your leadership on the idea that Safety-II was the necessary process to improve safety?**
    - By looking at how things normally worked and improving those functions instead of just looking at and preventing failure. This results in improving operations as well as preventing injury or death (Respondent #1).
    - The worker is not the problem, they are the problem solver. That is the challenge, the paradigm shift, and the conversation you have to continually have with leadership (Respondent #2).
    - Three fatalities in a two year period on projects that would have otherwise won safety awards. If we continued down this route, the same outcomes were likely to reoccur (Respondent #3).
    - Incident rates trending up in air and ground operations as well as couple of fatalities and our chief decreed something was going to be done. During investigations found that the newer workers in lower level positions were reluctant to offer their opinions even when they clearly saw a problem (Respondent #4).
    - Understanding that people will have errors and we have to be able to intervene before error occurs. We don't have to wait until an incident to identify what can bring it about (Respondent #5).
    - Focused on building relationships, particularly on building trust with our initial interactions (Respondent #6).

- We had transferred the risk out to the lower order injuries but hadn't changed the way we do things. Have we gotten better at safety or have we gotten better at measuring the symptoms of safety (Respondent #7)?
- Understanding and taking advantage of the collective knowledge that people have, such as worker engagement, there are huge opportunities to improve and lead to successful work. To move people toward the New View or Safety-II, you have to do a lot of work on human error, work on other points, and come back to human error. Very important to discuss work-as-performed (Respondent #8).
- Make sure the leaders understand the risk that human error poses toward their assets, operations, and profitability. I give them a broad perspective on the rough cost of human error (Respondent #9).
- If we can't get our leaders to buy in, we will get the employees to buy in. From that it was a gradual day by day sell the leadership that this is what our employees are doing to help themselves. So it came from the bottom up (Respondent #10).
- We had to go beyond looking at accidents and incidents, and potential accidents and incidents and from a human factors aspect, trying to improve how work actually works (Respondent #11).
- We had a lot of dialogue about how severe injuries were affecting us since we were operating in the red at the time, and how that would impact us moving forward. How do we get the employees engaged, have ownership, and help us with safety (Respondent #12).
- Our division leader is already strongly focused on safety and they have been driving us in this directions for the past year and a half (Respondent #13).

Table 2: Summary of Question 1 findings in descending order:

The workforce has a lot of expertise and can help us – 5

Improving overall operations and profitability – 4

Human error is a reality – 3

Organizations with high injury and fatalities – 2

Building relationships - 1

Leadership already bought in and implementing – 1

Safety is not getting any better – 1

Chart 1: Bar Graph of Question 1 Response Themes

2. **As the S&H Professional in your organization, what did you do to get started implementing Safety-II?**

- Equip managers and safety professionals with tools like learning teams, Gemba walks, debriefs, and a "Day in the life of." Simply describing actual work-as-done, a lot of times it makes sense why the failure occurred (Respondent #1).
- Introduced to human performance tools and the New View of safety over 20 years ago and that started it. Utilized Dekker's *Field Guide to Understanding Human Error* (Respondent #2).
- Took a traditional top-down approach and engaged with senior leadership immediately. Challenged the assumption that work gets done the way you imagine it gets done and found that work as delivered is very different to work as imagined. Find the bureaucracy that makes no sense. Engage the workforce to start to build the trust you need (Respondent #3).
- Deal with the principles of becoming a safer organization: all people are doing the best with what they have, we will do no further harm to our system, we will not create something in the report that doesn't further learning for the organization (Respondent #4).
- There are five steps to managing safety in an organization: compliance to regulations, behavior, management systems such as OHSAS18001 and ISO 9001, culture with processes to build consistency, and lastly Safety-II. Safety-II needs to be integrated in with the first four steps (Respondent #5).
- Working in a decentralized organization with each area having its own leadership and traditions. I had to understand those traditions don't usually move and I have to work within that framework. I also realized that change was going to be tough, but not

impossible and would take time while continuing to build trust and relationships (Respondent #6).

- Awareness of the concept of people as a source of resilience and not as a problem. Punishing people for things they do all the time is not correct (Respondent #7).
- Thinking about failure differently. Transitioning incident investigations so that we start to learn from incidents and not just blaming people and wasting organizational resources. Implement learning teams which have been very influential on organizations (Respondent #8).
- Once the decision is made to move forward, have one of the executives be the resource manager or champion. Start immediately managing the risk. Identify the critical steps in your high risk operations. If you want to change the way you think, change the words you use. Use the words of human and organizational performance. Be clear on what you want in terms of new behaviors for workers, supervisors, and managers. Look at your workforce with a sense of dignity (Respondent #9).
- Drive it with the employees first. We started an employee safety committee and began monthly training on Safety-II and socio-technical topics (Respondent #10).
- We published two white papers which was a bold first step in showing these ideas to the world. The second paper distilled some of the core ideas and offered practical advice to the ideas of moving ahead with Safety-II. We also had a number of conferences and courses in system thinking (Respondent #11).
- Get people on board with Safety-II with a proactive system with the employees involved. Identify and train the subject matter experts for the safety teams. Make sure

the senior leaders understand what Safety-II is and they are trained and engaged with the process (Respondent #12).

- Meeting with the leadership and engaging with plant operations. Having programs and systems in place that work proactively (Respondent #13).

Table 3: Summary of Question 2 findings in descending order:

Learning and training. Using debriefs, Gemba walks, etc. – 5

Working from the top-down with senior leadership – 4

Engaging the workforce – 3

Not blaming people for doing their job – 2

Recognizing people as a resource – 2

Be clear on your expectations – 1

Build from compliance to Safety-II – 1

Challenge that work-as-done is different from work-as-imagined – 1

Change the language you use to have people think differently – 1

Manage the high risk operations first – 1

Work through engrained traditions – 1

Utilize principles of safety – 1

Chart 2: Bar Graph of Question 2 Response Themes

3. **Do you feel that your upper management, as well as your management peers are on board with Safety-II and are they actively assisting you?**

   - Pushback from when you tell them they have to get out from behind their desks and go see work-as-done. Make sure the leaders allow time in their schedules to support this additional tasking. Other pushback is when I tell them to take the focus off of blame. Only utilize blame when after analyzing work-as-done it will truly improve performance (Respondent #1).
   - Good about talking Safety-II until something bad happens and they tend to revert to old ways. Have to continually have conversations and show improvement (Respondent #2).
   - The ones that really get it see it not just as a way of delivering on safety but as a more efficient business model. Some concerned about relaxing control and not knowing

everything. No one challenges empowering the workforce when presented but come up with many excuses when the time comes to implementing. They have to engage the workforce as to why they are doing things the way they are, not just conforming to a document that does not accurately reflect the task (Respondent #3).

- Depends on the person. Some tenaciously hold to the concept of punitive actions because they really believe it works. Takes time to shift to a culture of inquiry. This is about understanding instead of managing and part of this is developing a peer to peer dialogue (Respondent #4).
- Most safety people, not leaders are the problem because they are so focused on the reactive measures. Fixing safety people to understand Safety-II is the first step (Respondent #5).
- Depends on the leadership role. Those that do are actively looking at how they can assist. We have one of the highest accident rates in the federal government along with several fatalities (Respondent #6).
- Some embrace with open arms and others are just interested in staying out of trouble with OSHA (Respondent #7).
- In presenting this to leaders, design in opportunities for pushback. We have to give everyone a chance to learn and everyone goes at a different pace. It cannot be forced all at once. Best to pilot with a manager who is in agreement and build a learning team in their area. From there is can grow organically (Respondent #8).
- Expect them to. Up front they have to realize they have to do some things differently. This is not a program for the frontline workforce. It is a way of doing business and a way of thinking about work in their operations (Respondent #9).

- They are coming around, but quick to go back to the "Is it a recordable?" question whenever we have an event or accident. After that they are very supportive of not "blaming and shaming", but trying to learn from the event. Rather than just looking at it as the operator's fault, now we are able to show all of the systemic pressures the employee was under and the reasons why they made those decisions (Respondent #10).
- Upper management probably have very less visibility and still not very interested in it. It's more about reaching the safety professionals. It's harder to swallow for them because they are caught up in a compliance regime. Upper management is still fixated on number of incidents so there is still work to get to them (Respondent #11).
- Time will tell. We assign each senior leader to be a sponsor of a safety team, preferably one matching their expertise and this gives the employees a direct line to express concerns and gets the leaders involved at the same time (Respondent #12).
- Yes, definitely and they have overseen a complete re-write of our job safety analysis program and process (Respondent #13).

Table 4: Summary Question 3 of findings in descending order:

Pushback initially, but gradually get it – 8

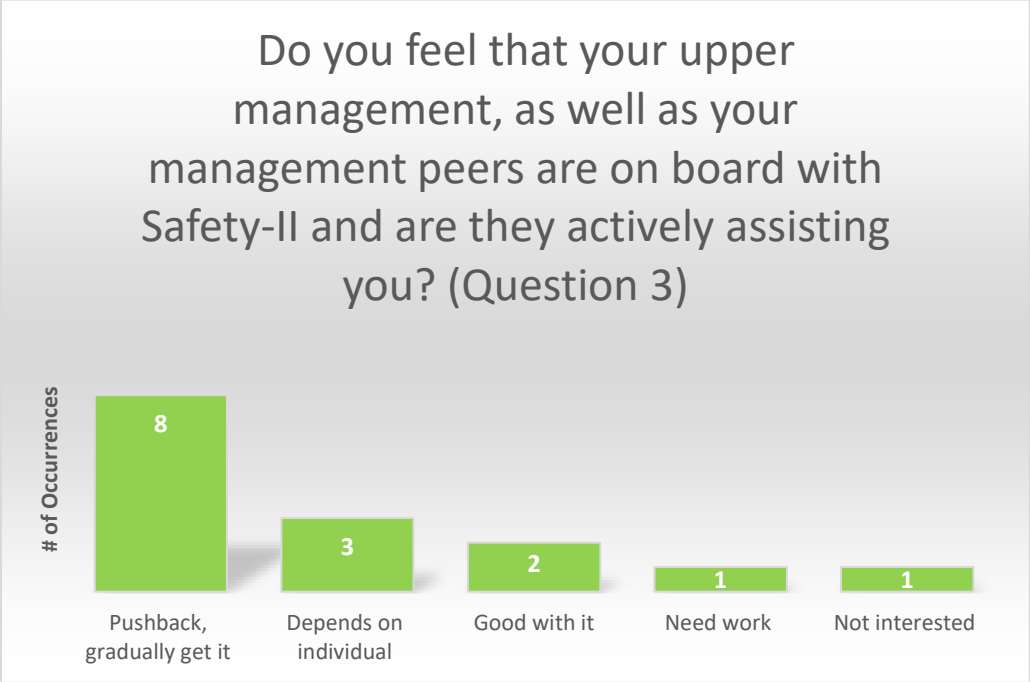
Depends on the individual – 3

Good with the concept – 2

Need more work – 1

Not interested – 1

Chart 3: Bar Graph of Question 3 Response Themes



4. **How are your employees empowered to have a voice in their day to day activities?**
   - You have to intentionally empower them. You have to get out there to get the information and provide the tools and support, create and sustain the space where people have a voice. The manager-employee interface is the key. They will not do it on their own (Respondent #1).
   - Employee empowerment is based on how leadership views the employees. It is hard to engage them if they think they are the problem. A lot easier if the converse is true. You have to help the leaders understand that the Safety-I view is old and by showing them there is a new paradigm. Once they are enlightened they tend to move forward (Respondent #2).
   - They are the ones who write the method statements and generate the risk assessments. They are the ones who essentially decide how they are going to work. Every

interaction with the workforce such as toolbox talks or pre-start meetings requires that 50% of that meeting has to be dialogue from the workforce. You talk about how effectively they can solve the problems they are about to face and employees become very comfortable that they have a contribution to make (Respondent #3).

- They are empowered, but still working on individuals who do not think that is a value. By dialogue we question the veracity of a rule. The quality and the idea of rules is questioned so we move the organization to more of a doctrinal approach (Respondent #4).
- Bridging work-as-imagined/work-as-done. While giving the technicians an established limit if authority/actions, we also give them the flexibility and the ability to adapt powerfully and effectively. A lot of technicians have a lot of great ideas that are best practices, but you have to give them that voice and recognition (Respondent #5).
- There is a function within the agency that allows them to pull a safety card and say this is an unsafe situation. Usually it is superintendents turning down an unsafe assignment. Other individuals in different organizations within the agency are more open about speaking up with these cards when faced with an unsafe situation and this gives them that voice. It is getting better year after year and trust is being built (Respondent #6).
- We work with a lot of management systems like ANSI Z10, we can't defend not using one. Engagement is a large part of that process and have to get a lot of direct engagement with employees through focus groups, risk assessments, hazard analysis, and incident investigations (Respondent #7).

- It goes back to the leadership point that workers have some incredibly important information that they need and they don't have to give it to them if they don't want to. We have to learn from the workers and share information with the workforce. We have to demonstrate that we are really interested in what they are doing. This is why the learning teams are incredibly helpful as this gives them a forum to discuss these things (Respondent #8).
- It is important that there is a learning aspect to work and feedback at the end of work. Managers are encouraged after every high hazard or high risk activity that there is a post-job or after action review to discuss work-as-done versus work-as-imagined. Learn from success as well as learn from failure. Managers are also encouraged to get out of their offices and spend time on the shop floor to get observation and feedback. The worker needs to know that it is ok to say that I almost made a mistake. The manager gets feedback on how the system supports or impedes safe performance and the worker gets feedback on their performance (Respondent #9).
- We had to work to overcome a deep-rooted culture but we convinced the workforce that they do have a voice and they do have the power to change the culture. We came up with a process for reporting near-misses and hazards and what they did to correct the hazard. Now we are moving to systemic hazards you don't see like conflicts between work instructions and procedures and identify those to the right people for resolution. We are using the learning team methodology so that all are involved in developing processes and procedures. Now I see engineers on the shop floor with the employees building relationships. They don't even realize how well this is working (Respondent #10).

- Through workshops and observations we tell the line employees how they are able to raise their voice. We talk about the employees being field experts and the tradeoffs and compromises they have to make in day to day work. The workshops enables them to have a voice in which we can report back to management. Fortunately, these groups have a fairly dominant culture and the problem is not speaking up, but getting something done about their concerns (Respondent #11).
- The culture you create is important. Staff and supervisors have to understand the power of listening. When we give our employees a voice with near-misses, observations, and performing risk assessments and other engagements we have to make them feel valued, know this work is important, listen, and react to what they are saying (Respondent #12).
- The plant had to communicate and make it clear to every employee that they should not operate unsafe equipment. They are to get help with it, shut it down and not struggle with it. The employee engagement program allows them to participate in the safety observation program, be involved in audits, and identify hazards. While there are a still a few holdouts, this message is communicated consistently from line leadership (Respondent #13).

Table 5: Summary of Question 4 findings in descending order:

Employees actively participate and are encouraged to speak up on risk assessments, incident investigations, and accuracy of work instructions – 8

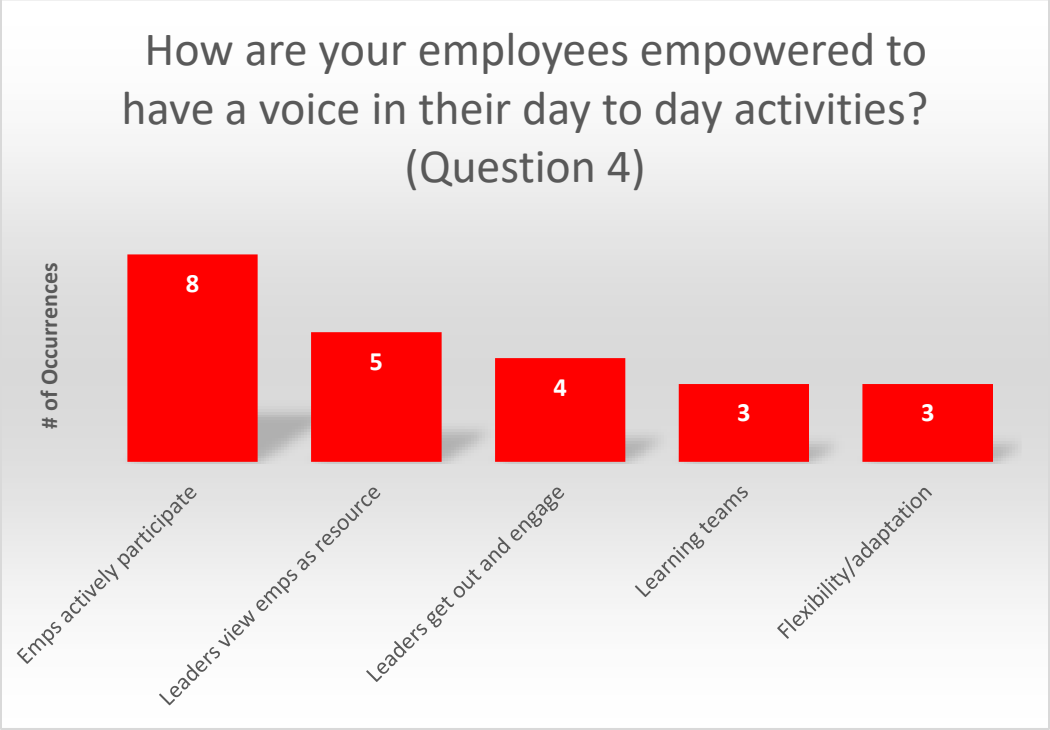
Leaders view employees as a resource and not a problem – 5

Leaders get out to the shop floor and engage the workforce – 4

Learning teams, toolbox talks, pre-start meeting and after action reviews – 3

Flexibility and power to adapt work and make decisions on safety – 3

Chart 4: Bar Graph of Question 4 Response Themes



5. **What tools and processes do you provide to ensure your employees' success when they go out to perform their tasks?**

   - Most important is the planning, the discussion, the meeting of the minds, projecting out how the work is going to go, the contingency planning, making sure we have the right tools, and anything else we need. Since all plans are imperfect, we have to have a learning aspect, a debriefing, after action reviews and Gemba walks in conjunction with our learning teams (Respondent #1).

- Help the employee help us identify where the problems are. Help them tell me what they need. Confidence to believe they have input and capacity to go out and do work in a highly variable system is what you manage (Respondent #2).
- We try not to give them too much stuff and work to remove redundancy in our safety management system. Next we ask what they wanted and like for them to come up with the ideas themselves. We have tools around planned versus actual assessments and collective insight. In incident investigations we teach how to investigate success. We give them a clear sense of empowerment because they understand the process better than anyone else (Respondent #3).
- Create an environment for success and recognize that every task involves learning something. Enjoin the organization in safety engagement sessions so people can voice their issues that are affecting them to their peers and superiors (Respondent #4).
- Create a "management stand" first which details expected behaviors and actions of the entire organization. Use it to communicate your expectations and the consequences of not complying and also to identify organization weaknesses. We must understand that humans will have errors and that cannot be stopped but also have management systems that will intervene at the sharp end. The employees have to not only be set up for success but understand what makes them successful (Respondent #5).
- One of the primary tools we use to help make decisions is the risk assessment to allow them to anticipate what will be taking place on each incident or job task. Another is "tailgate safety sessions" where people come together before they start

their day and each crew talk through about the details of operations, plan of daily events and the weather, and how that will affect them (Respondent #6).

- Work toward a checklist for high-risk environments which are filled out, signed, and turned in. Will also modularize equipment so that kits are established for the different types of repairs they perform. This in addition to the training they receive (Respondent #7).
- Learning teams are a way that you can systematically and hopefully institutionalize better engagement. So critical to this is to work on their mental models and help them on the journey to change and the way they look at things and to choose different methods (Respondent #8).
- The workforce needs to be trained and qualified. Technical expertise is fundamental to safe operations. Then they will be ready to respond to situations that are not covered by the procedures. Help them manage the risk and understand the critical steps. Use human performance tools and techniques such as crew resource management used in aviation (Respondent #9).
- We have given the employees the empowerment to do what needs to be done within certain constraints. They are empowered to make decisions for themselves. The reason this works is that if you take care of the little problems when they are first discovered, they won't turn into big problems (Respondent #10).
- They have all of the equipment, procedures, competency, and training that they need (Respondent #11).
- Make sure they are trained on the process and try to find out what their interests area. Make sure they have all of the correct tools and PPE. I believe in an optimized

performance approach that starts with a questioning attitude, checklists, and self and peer checks. Constantly educating them on safety also provides "mental PPE" (Respondent #12).

- Our training process. We do a lot of training, documentation, and use of checklists. We have done ergonomic assessments on every task and trained the employees on the safest way to do their jobs. We have trained the supervisors and technicians so that they can properly observe, coach, and correct when needed. Completed a complete PPE upgrade. Involvement in safety meetings, safety observation reporting and incident investigations. Daily shift huddles are conducted at the beginning of each shift and a comprehensive management of change process that spans across other facilities (Respondent #13).

Table 6: Summary of Question 5 findings in descending order:

Technical learning and training – 6

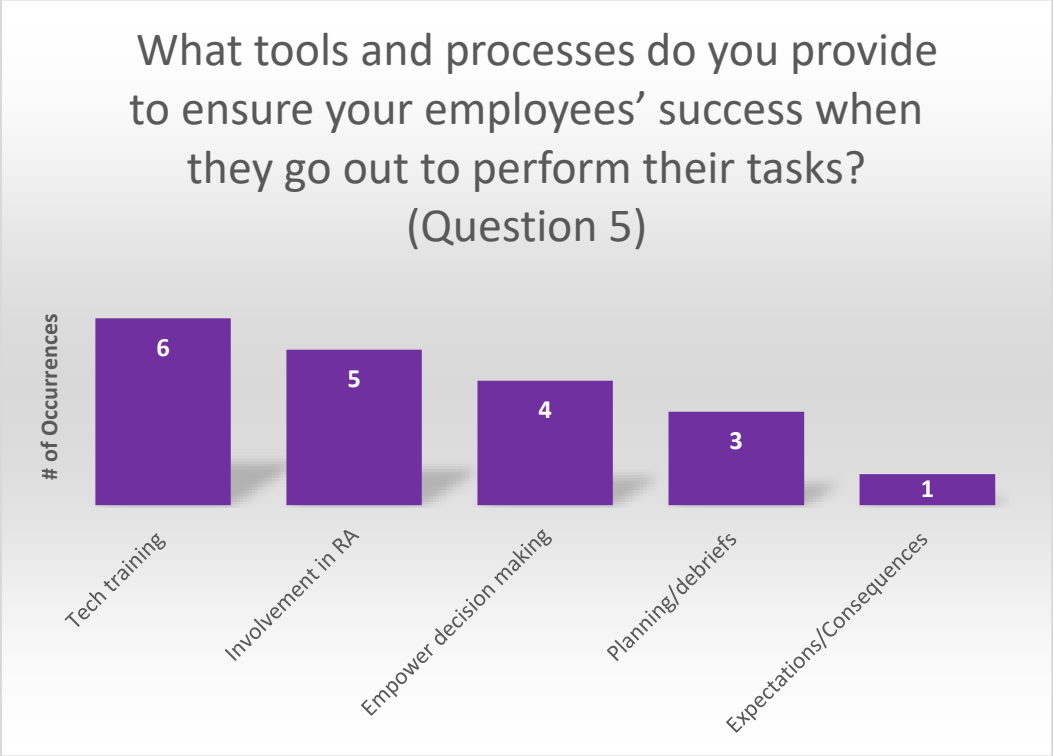
Involvement and training in risk assessments, incident investigations, using checklists – 5

Empower decision making – 4

Planning, debriefs, shift huddles, tailgate talks, and after action reviews – 3

Setting forth expectations and consequences – 1

Chart 5: Bar Graph of Question 5 Response Themes



6. **How do you measure and attempt to close the gap between work-as-imagined and work-as-done?**

   - The gap of work-as-imagined/work-as-done and to close is to get out and observe work and the accident investigations understanding it from work-as-done instead of the failure. This is not about the procedure but enabling the work to happen. Work-as-imagined/work-as-done have the same goal, how can we enable and facilitate forward looking accountability and the future outcomes we want (Respondent #1)
   - Not sure you want to measure because of its variability or attempt to close because workers need to be adaptive. One thing to learn is that workers always complete the design. They complete the instruction, procedure, and rule. The gap I'm concerned about is between work-as-imagined and the hazards they are exposed to. It doesn't

matter what was planned, it matters what happens. Auditing to work-as-imagined is auditing to a fantasy. Talk to your employees and understand how work-is-done and give dignity to that work (Respondent #2).

- When we do high-risk activities, there are checklists that ensure certain tasks are completed, have been planned properly in advance and outlined the go and no-go situations. These are non-negotiable and detailed to be complete. In lower-order tasks we allow a lot more latitude for the gap and we capture those gaps at the end of each day. We are working on a tool that looks at resources, control, and autonomy. This leads to a real-time resilience model for the lower-order tasks. Often it is not the gap that gets closed but that our systems get modified (Respondent #3).
- Do you want to close the gap? The gap is important and represents process improvement. The reality is the premise that we can independently design work. Actually, we need to design work in conjunction with the worker (Respondent #4).
- Start investigating successes and you will get a much better understanding of what the employees are up against. Integral to our incident investigation process is looking at it in terms of organizational weakness which will constantly show the gap. We must constantly show the gap to senior management to bring about change. Managers must go out and engage the employee, find out what is unsafe and what are the barriers to success. Once identified, correct the problem (Respondent #5)
- Within our fire organization, they anticipate through fire behavior analysis. A model is built and different strategies are developed based on that behavior. Success is often driven by available resources and the value of what is in the fire's path. We have

started only planning 80% of the workforce's day leaving the remaining 20% to deal with the unexpected (Respondent #6).

- If there are good, competent people writing the procedures and the work is fairly repetitive, then work-as-imagined/work-as-done is not that much different. The gap is often created by equipment, lack of equipment, or incorrect equipment. So in closing the gap you are performing a contingency and just trying to get work done and be efficient. Make sure the materials, tools, knowledge, and resources are there and available (Respondent #7).
- One technique is to hand leaders and workers 3X5 cards and write down what the big safety problems are, what are the most dangerous and high risks tasks. When these are posted there will be a gigantic gap between the two. Using learning teams to provide information to managers also helps them to see the gap. Important to get acknowledgement that there is a gap. Another important gap is the understanding of health and safety of the leaders and health and safety of the workers. This is the one to focus on first (Respondent #8).
- Rarely (if ever) is work-as-done is exactly the same as work-as-imagined. This is a key principle to comprehend, adopt, and accept. Recognize the gap is there and close the gap by looking into your system and organizational factors. Understand why it is there and make appropriate corrections (Respondent #9).
- We know the gap is there. We struggle with a complex socio-technical organization deeply rooted in tribal knowledge that is not written down. So finding the "blue line" (work-as-done) and gaining the employee's confidence that you are there to help, not hurt is key. It is up to leadership to empower the employees to tell me what I need to

do to fix this. Our Gemba walks have changed in that the employees are now showcasing what they have done where that wasn't the case years ago (Respondent #10).

- Using questionnaires we can look at the different responses between management and staff and from that we can measure what managers think about staffing, training, and procedures and what staff thinks about them. Without exception, it is far more favorable from the eyes of managers than staff. The questionnaires help quantify some of the aspects of the gap. So it is useful for managers to hear independently via researchers the perspectives of staff (Respondent #11).
- In performing job safety analysis and having an operator step you through what they do, I find they are just as surprised about the details of what they are doing. Closing the gap is going through each step of performing a specific task and talk through how it is done (Respondent #12).
- There is a gap that should be closed. One way is to make sure everyone is being trained the same way in order to reduce variability, especially when there are multiple trainers. Another way is to train the shift supervisors to have a full understanding of how the employee's job should be performed. Taking the standard operating procedure with you while the job safety analysis is being done and documenting the way it is done is another way of addressing the gap. Also we encourage people to tell us if there is something about the process that makes it difficult (Respondent #13).

Table 7: Summary of Question 6 findings in descending order:

Note: None of the respondents had a quantifiable method for measuring the gap and several opined that a method to do so did not exist.

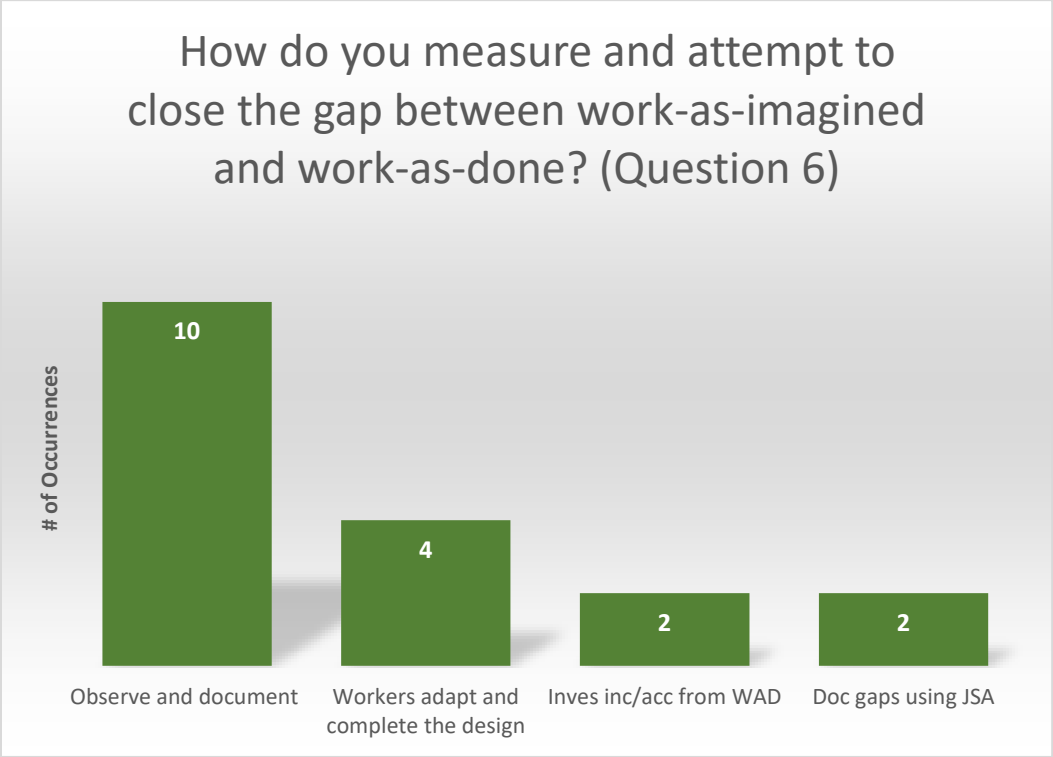
Observe and document work in conjunction with the workers. Engage the employees – 10

Recognize that workers always adapt and complete the design – 4

Investigate incidents and accidents from the perspective of work-as-done – 2

Document the gaps using job safety analysis, adapt or retrain as appropriate – 2

Chart 6: Bar Graph of Question 6 Response Themes



7. **What tools do you use to implement Safety-II and how do you perform risk analysis? Additionally, do you use or have you considered using Functional Resonance Analysis Method (FRAM), Resilience Assessment Grid (RAG), or Appreciative Analysis (AA) query as part of your risk assessment tools?**

- I try to use many of the human factors engineering tools like cognitive work analysis to understand how work is happening and what it would take to enable that work. I use FRAM but not the visual modeling. Resilience Assessment Grid is not something we have tried. The concepts of Appreciative Analysis is something I have used a lot.
    - FRAM: Yes; RAG: No; AA: Yes (Respondent #1).
- We do risk analysis to manage resource around the risk, not the risk itself. One thing I'm fixated on is not managing risk by probability but by certainty. So instead of asking what's risky, what is least recoverable? I assume there is a 100% chance it will happen and then ask what is our resilience? We tried FRAM, but found it to be difficult and complex. I have used appreciative suite for years.
    - FRAM: No; RAG: No; AA: Yes (Respondent #2).
- We have used FRAM a little but found it to be resource intensive and a lot of our people didn't understand the outputs. We have touched upon Hollnagel's resilience work. We are a people centric organization so our approach will always favor Appreciative Analysis because it involves people a lot more.
    - FRAM: No; RAG: Yes; AA: Yes (Respondent #3).
- Linear risk analysis is based on probability, severity, and data to support. You must have sufficient data to provide statistical reference and in most cases we don't do that. FRAM was a complete failure for us, we found it did not work well in an uncontrolled environment. Rasmussen axiom map works better for us. Have not used Resilience Assessment Grid and Appreciative Analysis query introduces a certain bias. We use John Adam's book entitled *Risk.* This is based on four points: sense of reward, probability, severity, and individual's propensity to take risk.

    - FRAM: No; RAG: No; AA: No (Respondent #4).
- I am not a fan of risk analysis because the majority of them are done non-effectively and are not dealing with what will make the person successful. Every person at an organization needs to be able to perform analysis based on their knowledge level. In our 3W process (Work, Worker, Workplace) if risk is found in one of those three, it is ok to move forward. If found in two or more then stop and escalate. It is critical that our employees have that level of authority.
    - FRAM: No; RAG: No; AA: No (Respondent #5).
- We don't use FRAM, Resilience Assessment Grid or Appreciative Analysis. The closest we come is using the Red/Amber/Green grid. The most productive example in the agency is the Job Hazard Analysis (JHA). We added the Red/Amber/Green into that form so that they put more time and thought into it. The education piece of this is still our biggest hindrance in getting this implemented due to turnover. I do not feel this tool is adequate, but it is at least starting conversations where it is being used.
    - FRAM: No; RAG: No; AA: No (Respondent #6).
- Risk analysis is performed very traditionally using 3X3, 4X4, 5X5 grids. We considered FRAM for pre-work and incident investigations, but are not using due to lack of resources. Resilience Assessment Grid, yes; Appreciative Analysis, yes somewhat between that and the cooperative analysis method.
    - FRAM: No; RAG: Yes; AA: Yes (Respondent #7).
- Never used any of these tools. The ones I've taught are Rasmussen's organization model and a system model developed by Nancy Leveson at MIT. This model states injuries and illnesses are caused by the interaction of system components. I have

been working on an iceberg model where only a small portion of underlying causes and patterns are apparent. People like tools like these because they are easy to use.

    - FRAM: No; RAG: No; AA: No (Respondent #8).

- Part of my offering is critical step mapping and the approach I promote is understanding the risk. If you study resilience engineering, they talk about system interfaces which are pathways between hazards and assets, and the touchpoints – or critical steps in an operation. For Hollnagel's resilience actions of respond/monitor/learn/anticipate, I look at them as a way of thinking. I am looking at using Resilience Assessment Grid to augment my own assessments. For FRAM, I want to use it for these critical steps, equating these to the functions in the modeler and feel there is an application for this. I do not use Appreciative Analysis.
    - FRAM: Yes; RAG: Yes; AA: No (Respondent #9).
- We recently started using FRAM. It is difficult to understand but it does start to project a process map of whatever it is you are looking at. The FRAM model brought out systemic difficulties we were all experiencing and did not recognize until then. This is a long-term, but extremely valuable process. Have not started using Resilience Assessment Grid yet.
    - FRAM: Yes; RAG: No; AA: No (Respondent #10).
- FRAM was used but not with great perceived success. Have not really used Resilience Assessment Grid and have not used Appreciative Analysis in the way it was formed. It only addresses one aspect and Safety-II is about what goes, not just about what goes well. We use system thinking methods that are consistent with Safety-II. We use native influence diagrams structured or unstructured around like an

axiomatic framework. Primarily I use observation, discussion, and system thinking methods.

  - FRAM: No; RAG: No; AA: No (Respondent #11).

- We do traditional HIRA (Hazard Identification Risk Assessment) of severity, probability, and frequency or some variation of this tool to give us a risk value. Job hazard analysis and job safety analysis is another form we use to engage our employees with. We update these on an annual basis. I have not used FRAM, Resilience Assessment Grid or Appreciative Analysis.
  - FRAM: No; RAG: No; AA: No (Respondent #12).
- I am not familiar with any of those tools. In using our checklist based management of change system and outlining what the project will include part of that is the risk assessments to be performed. In the initial stages and once drawings are produced we would use a Failure Mode and Effects Analysis (FMEA). If it is a chemical based process, it will be a Hazard and Operability study (HazOp). We will perform the traditional risk assessment for equipment interaction and ultimately the Job Safety Analysis for the people involvement and different tasks. We require the ANSI robot risk assessment for any robotic system.
  - FRAM: No; RAG: No; AA: No (Respondent #13).

Table 8: Summary of other risk assessment tools used in descending order:

Job Hazard/Job Safety Analysis – 3

Rasmussen tools – 2

Traditional Frequency/Severity/Probability – 2

FMEA – 1

HazOp - 1

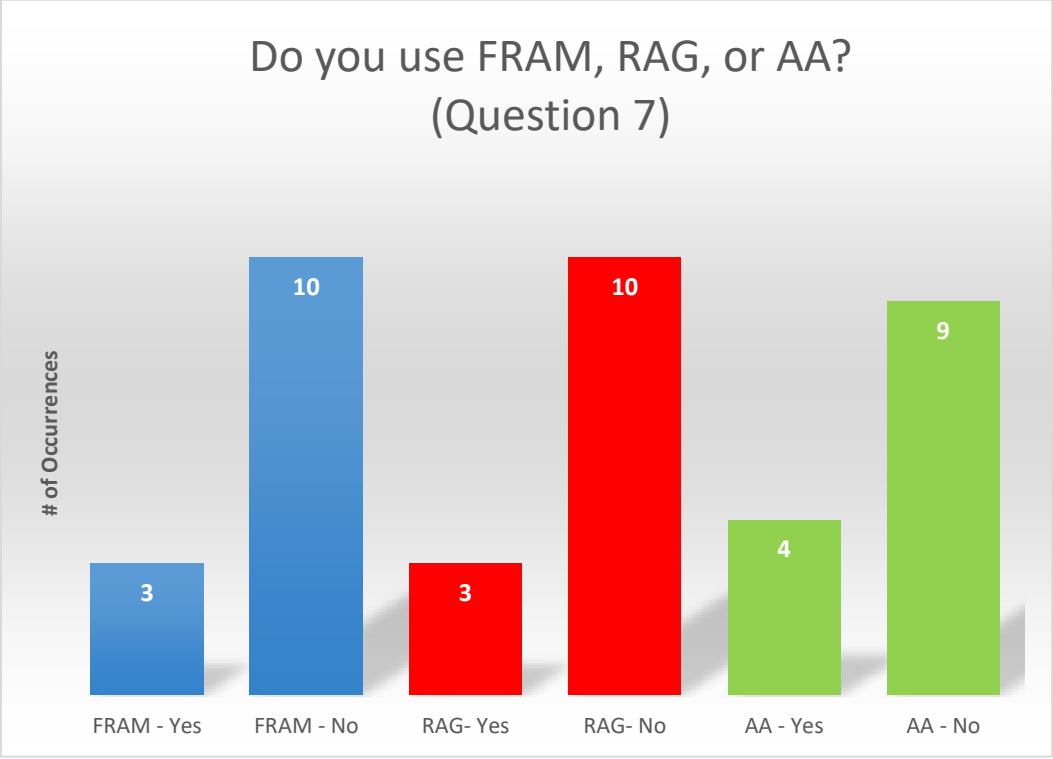
Human factors – 1

Influence diagrams – 1

John Adam's methods – 1

Resilience methods – 1

Chart 7: Bar Chart of FRAM, RAG, or AA Usage



8. **How do you measure safety success? How has this affected injury rates in your organization?**

- If you use Safety-II context, it is a capacity to be successful in varying conditions. You have to measure the potential to be safe and resilient. We need to get more

comfortable with qualitative metrics in terms of what it took to get the work done. Identify and share the stories that come out. Numbers are not telling you things that are a value. Injury rates are not a measure of safety success. Clients I work with claim their injury rates drop, but hard for me to claim credit. How an organization reacts to an incident is an indicator as to how they will be safe in the future (Respondent #1).

- If you see safety as an outcome to be achieved then you measure it retrospectively. If you see safety as a capacity, you measure it differently. You ask what is my capacity to do work in a high risk system in a variable system and what is my resilience and recovery? Look at safety as a vector, measuring direction and not discrete moments. Reactive measures are powerful, but are terrible metrics and not informative. Currently, there is no such thing as a leading safety metric. If there were we would be using them now (Respondent #2).
- We have three baskets of measures. The first are traditional measures that our clients request. While not particularly informative, knowing how many people are injured is still important. The second are system health metrics that tell us that the system is doing what we want. For example, actions generated from severe close call investigations are considered gifts and we need to extract all possible learnings. The third is Hollnagel's risk monitor and anticipate/learn piece where we can do a lot of singularly focused testing and comparison with accidents relationally. Not particularly accurate but still a good indicator of how our people are feeling. Our accident rates have fallen, but we have also seen the amount of time people take off as a result of an accident also fall (Respondent #3).

- We have multiple success measures. One is that the field crews understand what the conditions are doing to them, how the conditions are managing the situation which drives a deliberative and less efficient response instead of the crews managing the situation. Here we introduce Condiment's idea of system 1 and system 2 thinking. We still have to do all of the OSHA statistics, but once we started thinking systematically the injury rate has declined. Reporting has improved as well (Respondent #4).
- We don't measure incident rates. Instead we measure on positive actions that will lead to a more robust organization. Unless you are using Safety-II you are going to get to a certain level and not improve. Using incident rates to drive behavior will only lead to manipulation of those rates. Measure actions, not outcomes. If you must measure outcomes that will produce success. Measure input instead of output (Respondent #5).
- For statistics, we use the Safety-I method. Comparing us with other federal agencies we vary between ten and twenty percent. We show out fatalities and the details, but a lot of the minor incidents are being normalized so we can't use that as part of our success. One part that has been successful is with people sitting down and having open, frank conversations. Varying effectiveness but is building trust within the organization (Respondent #6).
- Injury rates mean nothing to me. In systems safety success is by risk reduction. You quantify risk reduction as best you can by a risk priority number. When you measure success, you look at improvements based on proactive endeavors to reduce risk and the dollar cost. You have to measure overall risk ratings and cost to risk (Respondent #7).

- Safety directors anecdotally tell me that we have done has made a big difference, but don't have specifics. One large organization adopting the New View stated that incident rates had dropped 20%. This is a measure that is incredibly overused and misused. If the New View is implemented right then there will be more reporting of incidents and that's an improvement. Nancy Leveson stated on leading indicators that if you have a systemic view then you realize that safety is an emergent property and you have to figure out what are the key factors of your control structure. We should be measuring the integration and how the system pieces fit together. How does leadership fit with the workers, how does safety integrate into the operations? (Respondent #8)
- It has absolutely affected injury rates. After implementing Safety-II, one of my clients had a sustained significant injury reduction from their field operations. If you are using lagging indicators, the traditional safety metric is a negative metric and the tendency for the direction of goodness is to go to zero. You have to start measuring leading indicators of people's behavior toward the assets and hazards and are the condition of your assets within constraints (Respondent #9).
- We're using Safety-I reporting with our injury rates and it is hard to get away from that. However, it is showing good results from 2011 to 2017 our incident rate dropped from 5.6 to 0.8, worker comp claims went from $381,000 to $18,000, and lost workdays went from 1,481 to 16. This is the only vehicle I have found to get to senior leadership. This does not tell the story of all of the corrective actions and I am proud of these numbers but recognize these measures are not the message I want to send (Respondent #10).

- We don't look at injuries, but incidents. I would rather use discussions and interview data to qualitatively understand safety rather than measure safety success. Measuring reactive measures is un-safety success (Respondent #11).
- When I talk to the workforce and I tell them safety is about morale, feeling good about what you are doing and that we will react to a safety issue. Do your employees have a good questioning attitude? Do they feel comfortable bringing up issues about safety? One way to measure safety success is how your employees react to safety day in and day out. Do they come and talk to you about safety at home? How many near-misses are being reported? Are they bringing up hazards and solutions to your attention? Do you have a system that promotes good conversations about safety? These things have to help (Respondent #12).
- Unfortunately we still measure by recordable frequency. We are also trying to measure it by safety involvement and each member of the plant staff and leadership have an objective around safety involvement. They have the responsibility of overseeing one of the primary safety objectives for the year and are measured on their success. We have an objective for 90% of the plant employees to have at least six points on our employee engagement program. One thing that has impacted our injury rates is shift supervisor involvement and leadership engagement. Mandatory daily shift huddles generate a report which is read by leadership and produces follow up on any concerns (Respondent #13).

Table 9: Summary of Question 8 findings in descending order:

Injury rates are not a measure of success – 9

Safety-II actions have positively affected injury rates – 8

Measuring actions instead of outcomes – 3

Capacity for success and resilience – 2

Close-call/Near-miss reporting – 2

How the organization reacts to an incident – 2

Risk monitoring and reduction – 2

Understanding conditions in which you work – 2

Workforce engagement – 2

Measuring system integration – 1

Chart 8: Bar Chart of Question 8 Response Themes

9. **When do you feel the need to "refresh" safety in your organization?**

- All the time. If I flip this statement and ask when is not the time to refresh safety and that is when an accident occurs and people want to knee-jerk and make everything worse. From a Safety-II lens, accidents are not failures of a broken component but unintended outcomes of system design. We should be continually learning (Respondent #1).
- It is a capacity so you are always refreshing safety (Respondent #2).
- Respondent #3 was overlooked on this question.
- Continuously, it never stops (Respondent #4).
- You are selling all the time the future potential of safety. Always look at safety as an organizational issue (Respondent #5).
- To me it's every day. If we keep doing the status quo, we will be getting the same outcomes over and over again (Respondent #6).
- When nothing is going on and it's quiet. Systems require feedback, when everything goes well, this is when you have to start leadership engagements and hazard/job safety analysis (Respondent #7).
- When you do the New View and focus on successful work, it just energizes everyone. The need to refresh is less because it seems to have an energy of its own. It is a self-sustaining continuous improvement process (Respondent #8).
- I promote the idea that when you talk about production, you had better be talking about safety at the same moment. The safety ramifications of those productions plans should be concurrent. Overall, I think it should be ongoing (Respondent #9).

- We do it daily. Each week we have a theme of safety and each workday builds on that theme. Safety has a solid communication on this area (Respondent #10).
- That's the reason for Safety-II, you always need to reevaluate it. It's an ongoing process (Respondent #11).
- Every day, you have to live it every day. To keep it fresh you have to walk it and talk it and can't let up (Respondent #12).
- Every year you have to. You have to look at what you've done, where you're going, where you've been. Look at doing something differently. It could be refreshed more often. Never be satisfied with the results, for that is when things will start to revert to the old ways (Respondent #13)

Table 10: Summary of Question 9 findings in descending order:

Continuously, daily – 9

When the system is quiet – 1

Safety-II is self-sustaining – 1

Annually and more frequently if needed – 1

Chart 9: Bar Chart of Question 9 Response Themes

10. What would you recommend for someone coming behind you? In other words, what would you do differently if you were just starting out?

- In new safety professionals, there is a heavy emphasis to a compliance-based approach. I would not be getting people with safety degrees, but more so in the social sciences and learning about how people operate in systems. A fundamental of Safety-II is understanding how social systems work in a complex environment (Respondent #1).
- Read more and think. Consciously focus on how we see the worker colors how we manage this program. The next great safety people are those that understand systems and complexity (Respondent #2).

- Make sure that you build the philosophical case for what you are doing. Make sure you understand why we are doing this. The bottom up approach is good and I think we could have pushed a little harder and faster than we did (Respondent #3).
- Understanding the relationship my office (organizational learning and human performance) has with the organization. I thought of my job as a support function, but it is actually a translator so field and leadership can communicate and this how we build bridges in order to improve safety (Respondent #4).
- In addition to technical safety, you also have to be an organizational coach and build in yourself uncommon knowledge to do this (Respondent #5).
- First, learn the organization more in depth. I would concentrate less on the data and more on those proactive conversations and finding ways to start them. Those conversations that build upon the long term and keep building and having them continuously (Respondent #6).
- For Safety-II, keep learning the concepts. People have to be ready for the information before it gets put in front of them especially in terms of Safety-II. How do you get people interested in this before they are totally indoctrinated in the regulatory aspect of this profession? Require a class in developmental or industrial psychology so they can understand how people see the world (Respondent #7).
- Study like crazy and learn as much as you can. Safety people are usually in crisis management and don't have time to read or think. One challenge is to create tools and materials that can help those on the journey with limited time (Respondent #8).
- Make sure management takes responsibility for human and organizational performance. It is most important that managers are held accountable for managing

the risk and systems learning. Don't live with problems you can fix now. I target managers since what is happening in the workplace is because of management. Help managers understand how their systems work to create performance and outcomes (Respondent #9).

- Prepare for difficulties when presenting this message. It is extremely important to understand that behavior is based from a culture and an environment of the system. Stop trying to fix the person and fix the environment (Respondent #10).
- Spend as much time at the sharp end. No time spent there is wasted. Spend as much time as possible building relationships and as little time as necessary in the office (Respondent #11).
- Have the courage to speak up. You have to have people openly talking about safety. You have to have a really strong tone that we are all empowered and that is critical. Communicate and listen (Respondent #12).
- You need to spend as much time out on the production floor as possible when you're new. You need to understand what is going on and what the hazards are. Get to know the people out there and they need to know you. Build a relationship with everyone and gain their trust (Respondent #13).

Table 11: Summary of Question 10 findings in descending order:

Build your case and push harder – 3

Understand social systems in a complex environment – 3

Read and educate yourself more – 3

Build relationships – 2

Spend time at the sharp end – 2

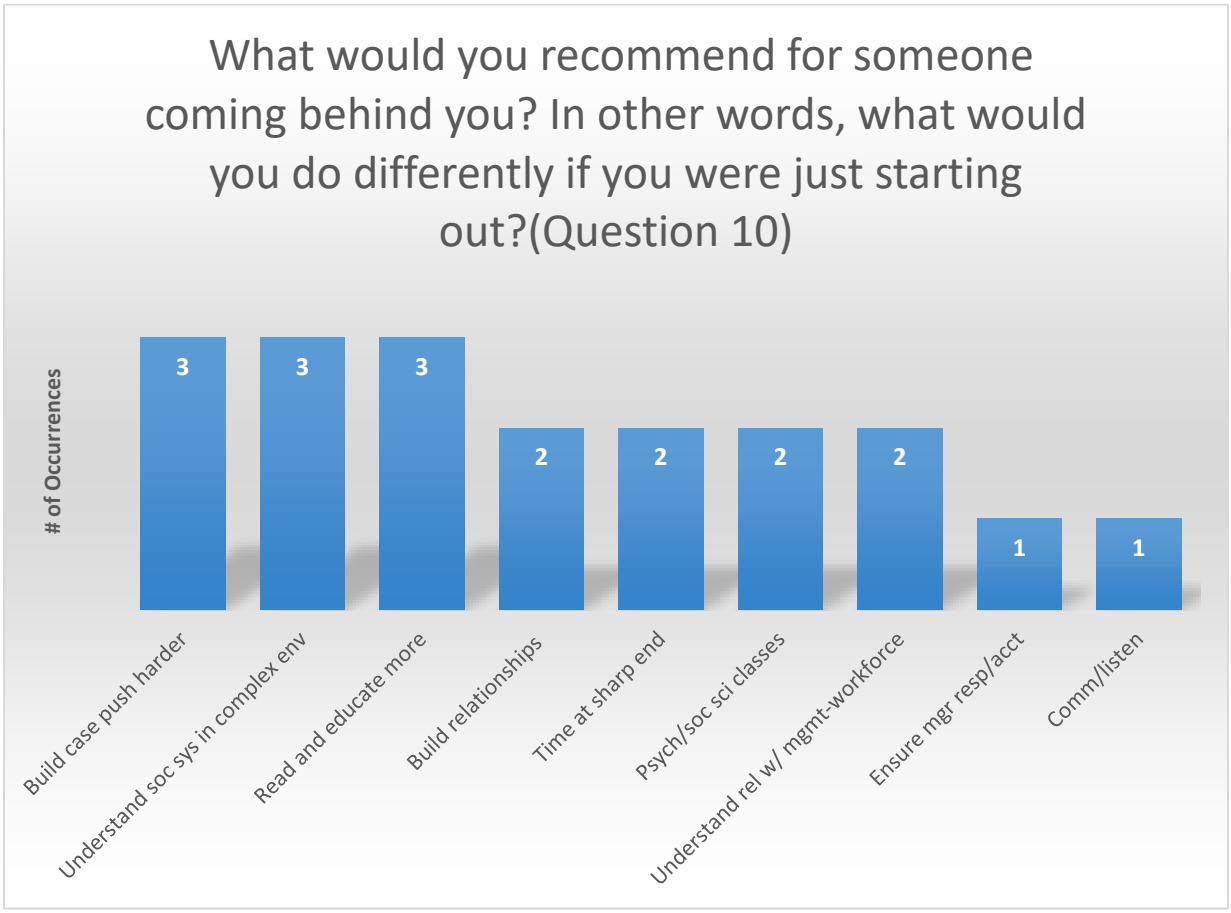
Training in psychology and social sciences – 2

Understand the relationship you have with management and the workforce – 2

Ensure managerial responsibility/accountability – 1

Communicate and listen – 1

Chart 10: Bar Chart of Question 10 Response Themes



11. Are there others that you recommend who have enjoyed success implementing Safety-II?

- Five of the respondents provided a total of nine additional contacts. Six of these additional candidates were reached out to of which four responded and were interviewed. Three were not solicited due to the author having already obtained a sufficient number of interviewees when these were offered. Eight of the respondents were not solicited on this question due to a sufficient number of interviewees being obtained by the time their interview was conducted.

DISCUSSION

Throughout the preceding pages, this research outlined the concepts of Safety-II and has offered documented evidence of its success through live interviews of thirteen individuals who are applying these concepts on a daily basis with positive results.

Safety-II acknowledges several realities that are a part of everyday life. The first is that humans inevitably commit errors and this cannot be rewarded or punished away. Errors are incorrectly seen as the cause of incidents, when in actuality it is losing control of the ability to manage the situation (Conklin, 2012). Next, human performance is variable and can occur for numerous internal and external reasons (Hollnagel, 2012). Thirdly, work-as-imagined is usually greatly different from work-as-done since it is impossible for those at the blunt end to anticipate all the conditions that can exist (Hollnagel, 2014). According to three of the interviewees, acknowledging the reality of human error was a key point in selling Safety-II to their leadership.

Employees are there to be part of the organization's success and should be empowered to have ownership in the process. To do this, senior leaders must release power, resources, and responsibilities in order to better motivate these individuals. This will result in higher customer satisfaction, innovation and lower turnover (Siegel, 2016). Use rules and procedures as support and expert guidance. Recognize that the ability to make performance adjustments (in a controlled fashion) is essential to understanding work-as-done (Dekker, 2015). Empowering decision making was noted as a key tool in ensuring employee success by four of the interviewees in question five. Eight of the interviewees (seven government, construction and manufacturing employers, and one consultant reporting on behalf of their clients) noted that their employees have an active voice in their daily activities. Five (four construction and manufacturing employers, and one consultant reporting on behalf of their clients) noted that leaders view

employees as a resource (question four). In the same light, encourage and incentivize incident reporting as a tool for an open and robust exchange of information about safety relating to training and procedures. This is especially true in near-miss reporting where there can be anywhere from 50 to 600 near-misses for every injury (Williamsen, 2013).

When a safety incident does occur, it should be investigated, but from a point of view of those doing the work. Understand that what usually goes right occasionally goes wrong. This will point out that investigating using a linear process that implies a strict sequence of events blinds the investigators to cognitive patterns and organizational dynamics. How we investigate and how we as leaders respond to an operational failure matters greatly (Johannesen et al., 2012). One respondent stated that incident investigations are done from perspective of investigating success not failure. Two investigate from the perspective of work-as-done, not work-as-imagined. One investigates the systemic structures in place that allow incidents to occur.

All organizations have risk which varies depending on the function. They should be proactive in identifying and managing these risks, and establishing an ideal model of defenses. Once that risk has been analyzed, set it alongside the real situation and see where the divergences are that will lead to a safety incident (Amalberti, 2013). All of the interviewees noted using some form of risk management tool or process to proactively manage risk (question seven).

Safety-II is defined as the ability to succeed under expected and unexpected conditions, so that the number of intended and acceptable outcomes is as high as possible. In Safety-II, the absence of failures is a result of active management and is marked by a presence of successes. The more successes there are, the safer the system is. Safety-II assumes that systems work because people are able to adjust what they do to match the conditions of work. Workers identify and overcome design flaws and glitches because they have the ability to recognize demands and

adjust accordingly. They interpret and apply procedures to match the conditions. They can also detect and correct when something goes wrong and intervene (Hollnagel, 2014). Involvement in the risk assessment process was noted as a key tool by five of the interviewees and empowering decision making was noted as a key tool in ensuring employee success by four of the interviewees in question five. Eight of the interviewees (seven government, construction and manufacturing employers, and one consultant reporting on behalf of their clients) noted that their employees have an active voice in their daily activities in question four.

Resilience is another important aspect of Safety-II. This comes from a set of capabilities to recognize the boundaries of safe operations, steering back in a controlled manner and recovering from a loss when it does occur. It is a presence of these capabilities, capacities, and competencies to make things go right. Overall, organizations must look at themselves in relation to their environment and determine the basic sources of resilience their system requires (Dekker, 2015). Three of the interviewees reported that they view their employees as a source of resilience and three also using Hollnagel's (2017) Resilience Assessment Grid from question seven.

Measure safety performance by proactive metrics. From a resilience standpoint this can be looking for the gaps between procedures and the variations, uncertainties, events, and complicating factors that challenge procedural work. This again leads us to view the workforce as a normal source for local adaptive action. They can proactively manage their risk by spending time and resources identifying, correcting, and possibly eliminating hazards before they result in a safety incident (Woods, 2009). All of these can form the basis for measuring safety proactively. During the interview process, nine of the thirteen interviewees reporting that measuring safety by reactive measures was not an effective means of measuring safety success, but eight of those interviewees stated that Safety-II had positively affected injury rates.

Safety success should be celebrated by what is done to make workplaces safer as opposed to when nothing goes wrong. Within a proactive culture, goals are established which focus on improving key elements of safety and fostering active employee involvement. Recognition for safety and health performance is based on system measures such as high audit scores or job safety analyses. Recognizing and celebrating these contributions help ensure continuous improvement of safety and help drive down safety incidents and associated costs (Earnest, 1997). There were numerous methods reported by the interviewees in question eight on how they measured safety success instead of or in addition to reactive measures. Three measure actions instead of outcomes, two measure capacity for success and resilience, two measure close-call/near-miss reporting, two measure how the organization reacts to an incident, two measure risk monitoring and reduction, two measure understanding conditions in which you work, two measure workforce engagement, and one measures system integration.

If there is a gap between Erik Hollnagel's concepts and what is being practiced by the interview respondents, it would be that while no one disagreed with the concepts of Safety-II as an effective means to improve safety, nine of the respondents are still reporting safety performance using reactive metrics (in addition to the statutory OSHA requirements). This despite that all were in agreement that these were not an effective measure of safety performance. This demonstrates that much work remains to be done in convincing those organizations leaders to view safety performance by these methods. This is an ongoing process indicated by the responses to question three that over time, most of the leaders reportedly start understanding and adapting to Safety-II. It was also indicated by three of the respondents, that getting peers on board with the idea of not assigning blame worked well in concept, but required

intervention to stay with this thinking when an actual incident occurred. It is also noted that using IPA to identify and recruit respondents led the author to those individuals who already acknowledge the benefits of Safety-II. Lacking in this research was examples of anyone who disagreed with the benefits of Safety-II. The author was unable to locate any statistics that indicate how many organizations have adopted Safety-II methodologies. It could be anecdotally stated in this author's opinion that they are in a small minority. As this concept continues to gain acceptance in the safety community, based on the volumes of literature on the subject, it can be expected to grow substantially over the coming years.

CONCLUSION

This thesis has explored the concepts and benefits of applying Safety-II methodology in the workplace and has offered supporting evidence that adopting these practices has a positive impact on improving safety performance. Points that were addressed as part of the research question (and were responded to by the interviewees): implementing Safety-II; organizations obtaining buy-in from their leadership and employees; tools and techniques that are used in daily practice; and measuring the success of Safety-II. All of these points were answered in great detail by the literary review and the interviewee responses as detailed in the **Results** and **Discussion** sections.

All of the respondents gave very freely of their valuable time to contribute to this research and demonstrated their continued success with implementing Safety-II at their workplaces or those of their clients. The concept of empowering the employee to have ownership of their processes and freeing them from fear of reporting safety incidents and unsafe work conditions not only improves employee morale, but productivity as well. Additionally, measuring the success of safety by proactive metrics as opposed to reactive has been demonstrated to have much more value to understanding safety performance.

This author experienced firsthand the benefits of taking a proactive approach to safety and the positive effects it had on the employees who enjoyed a greater reduction in workplace injuries and an increased belief that the organization was expending considerable resources to keep them safe. The effects of applying these concepts was reinforced by the comments made by the thirteen interview respondents. While no two did everything exactly the same, the benefits and rewards to the organizations were strong and tangible.

This research was limited to a review of literature that demonstrated the benefits not only to safety but to overall productivity and profitability by an adaptation to Safety-II methodologies. This was reinforced by the thirteen respondents who are all enjoying various level of success by either implementing Safety-II at their own workplaces or advocating it in their role as a consultant. Any information that would offer a contrasting view to these practices is outside the scope of this research.

Despite the research that was conducted for this thesis, the question asked in the title: "How is Safety-II Being Applied in Practice and is it Working?" is still inconclusive. The reason for this statement is due to the answers provided in question 7: "What tools do you use to implement Safety-II and how do you perform risk analysis? Additionally, do you use or have you considered using Functional Resonance Analysis Method (FRAM), Resilience Assessment Grid (RAG), or Appreciative Analysis (AA) query as part of your risk assessment tools?" Despite all of these individuals being strong advocates of Safety-II and its methodologies as well as having positive results from their adaptation, many of the respondents are still using traditional tools for measuring risk. Seven of the thirteen are not using FRAM, RAG or AA. While the traditional risk management tools have a long track record in identifying and attempting to quantify risk, they are mostly linear in nature (Amalberti, 2013) and not designed to specifically identify the variations inherent in socio-technical systems. Two of those seven respondents noted that they used Rasmussen tools (Rasmussen, 1997) and one also used a system model developed by Nancy Leveson (Leveson, 2004). Noteworthy is that these are tools that take into account work in a socio-technical environment.

There are at least a couple of potential reasons for the use of FRAM, RAG, and AA being in the minority. All of these tools are relatively new. Hollnagel's book on FRAM was published

in 2012, his book on RAG was just released this year, and AA is the oldest having first been discussed in 1987 (Salopek, 2006). In contrast, some (not all) of the traditional tools mentioned have been in use since the 1960's or earlier. HazOp for example was developed in the 1960's for the chemical industry (Vincoli, 2014). These traditional tools have a long history of use and many safety professionals are already familiar with them since they may have been in use at their workplace for some time and there is considerable expertise and examples of their use. Another reason is ease of use. It was noted that FRAM was considered resource intensive by two of the respondents. It was also noted by two of the respondents that traditional tools such as Job Hazard Analysis were used due to ease of use and administration.

RECOMMENDATIONS FOR FUTURE RESEARCH

For the next individual performing research on this topic, they could consider expanding on the research of who is actively using the FRAM, RAG and AA tools and why, what are the benefits that led them to adopt them, and what were the obstacles encountered on the journey to implementation. Additionally, what are some of the tangible aspects and learnings that have been realized by their adaptation? The three respondents that are actively using FRAM clearly indicated the benefits and their intent to continue its use.

When these thirteen individuals were solicited to participate in this research, the definition of Safety-I and Safety-II (as noted in Appendix 3) was provided in advance to them. While the majority of the respondents were very familiar with the terms, a few were hearing the specific definition for the first time, despite the fact that they were actively following at least some of the Safety-II methodologies due to personal research or collaboration with colleagues that this was an effective means to improve workplace safety. A question to ponder is: did

providing these definitions in advance bias those respondents not already familiar with the term to craft their responses to attempt to more closely match what Safety-II is advocating?

The contribution that this research provides is to demonstrate that putting Safety-II into practice will result in not only improved safety performance as attested by the interview respondents but overall organizational improvement as well. These methodologies if implemented and sustained can have a profound impact on workplace safety and take safety performance to much higher levels than Safety-I can provide.

This author witnessed firsthand how a proactive approach to safety made a positive impact, even though still measuring performance by reactive statistics. An adaptation of these methodologies by more and more organizations will in time affect current safety practices as we know them and can greatly reduce the overall number of workplace incidents, and in addition improve morale and overall contributions by an involved and empowered workforce and leadership that has built trust with that workforce.

Successful Safety-II implementation at an organization ideally begins with commitment by the leadership to make this happen and to champion its progress. This research demonstrated one example where it was successfully done from the safety organization by permeating it into the workforce and nurturing its growth. This proved to be a significant challenge when there is not yet leadership buy-in. Unfortunately, two of these respondents noted that workplace fatalities were one of the prime catalysts for driving change in safety performance and hopefully change in other organizations that have not yet embraced these concepts can be realized before that occurs.

For those interested in pursuing these methodologies further, a review of the literature referenced in this research is recommended and specifically Hollnagel's (2017) latest book *Safety-II in Practice: Developing the Resilience Potentials* provides an overall picture to these

methodologies in a relatively concise format. From there, partnering with outside expertise to understand the specifics of implementing and sustaining Safety-II is also recommended. As with any notable organizational change, it will take time to be successful.

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APPENDICES

Appendix 1. Respondents' Job Titles

Respondent #1: Vice-President of a safety consulting company.

Respondent #2: Health and Safety Director for a large governmental agency and private safety consultant.

Respondent #3: Health and Safety Director for a global construction consortium.

Respondent #4: Director of Learning for a large governmental agency.

Respondent #5: Private consultant and retired environmental, health, and safety global internal consultant for a global manufacturing corporation.

Respondent #6: Health, Wellness, and Resilience Manager for a large governmental agency.

Respondent #7: Senior consultant of a safety consulting services company and adjunct university professor in health and safety.

Respondent #8: Principle for a safety training and consulting company.

Respondent #9: President of a safety training and consulting company.

Respondent #10: Safety Manager for a global aerospace equipment company.

Respondent #11: University Professor and private safety and health consultant.

Respondent #12: Production Safety Lead at a large manufacturing facility.

Respondent #13: Production Safety Specialist at a large manufacturing facility

Appendix 2. Institutional Review Board Approval Letter

EAST CAROLINA UNIVERSITY
University & Medical Center Institutional Review Board Office
4N-64 Brody Medical Sciences Building· Mail Stop 682
600 Moye Boulevard · Greenville, NC 27834
Office 252-744-2914· Fax 252-744-2284

www.ecu.edu/ORIC/irb

Notification of Initial Approval: Expedited

From:	Social/Behavioral IRB
To:	James Turner
CC:	Michael Behm
Date:	9/19/2017
Re:	UMCIRB 17-001963 How is Safety-II Being Applied in Practice and is it working?

I am pleased to inform you that your Expedited Application was approved. Approval of the study and any consent form(s) is for the period of 9/18/2017 to 9/17/2018. The research study is eligible for review under expedited category #6, 7. The Chairperson (or designee) deemed this study no more than minimal risk.

Changes to this approved research may not be initiated without UMCIRB review except when necessary to eliminate an apparent immediate hazard to the participant. All unanticipated problems involving risks to participants and others must be promptly reported to the UMCIRB. The investigator must submit a continuing review/closure application to the UMCIRB prior to the date of study expiration. The Investigator must adhere to all reporting requirements for this study.

Approved consent documents with the IRB approval date stamped on the document

should be used to consent participants (consent documents with the IRB approval date stamp are found under the Documents tab in the study workspace).

The approval includes the following items:

Name	Description
Expedited Thesis Consent	Consent Forms
Expedited Thesis Interview Turner	Recruitment Documents/Scripts
Safety-II Thesis Proposal	Study Protocol or Grant Application
Safety-II Survey Questions	Data Collection Sheet
Safety-II Survey Questions	Interview/Focus Group Scripts/Questions
Safety-II Survey Questions	Surveys and Questionnaires

The Chairperson (or designee) does not have a potential for conflict of interest on this study.

IRB00000705 East Carolina U IRB #1 (Biomedical) IORG0000418
IRB00003781 East Carolina U IRB #2 (Behavioral/SS) IORG0000418

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Study.PI Name:

Study.Co-Investigators:

Appendix 3. Institutional Review Board Recruitment Letter

From: J. Allan Turner, CSP

To: Interviewee Participant

Cc: Dr. Michael Behm, CSP

Date 9/20/17

Re: Request for Interview on Safety-II Practices and Results.

Encl: Survey Consent Letter

Dear Participant:

My name is Allan Turner and I was given your contact information by Dr. David Borys as a resource to help with the development of my graduate thesis entitled "How is Safety-II Being Applied in Practice and is it Working?" The purpose of my writing is to ask you to take part in my research study and your participation is completely voluntary.

I am currently working on completing my Master of Science in Occupational Safety at East Carolina University (ECU) in Greenville, NC, USA. Recently, I retired after thirty years of service at Corning, Incorporated's optical fiber manufacturing facility in Wilmington, NC. The last nine of those years I served as the safety and health lead for this large factory. I am also retired from the U.S. Navy Reserve where I served 26 years as a supply and logistics officer. Those years at Corning and with the U.S. Navy taught me many valuable lessons about the benefits of taking a proactive approach to safety.

David introduced me to Erik Hollnagel's concept of Safety-II while taking a safety management course last year under him. This view of safety greatly intrigued me and led me to base my research study on this topic.

He speaks highly of you as a safety leader who has also embraced this approach to safety management. Your experiences with Safety-II would contribute much to my research. You are one of twelve individuals that I would very much appreciate an opportunity to interview and learn more about your journey.

For the purposes of this research I am particularly interested in Safety-II as it relates to construction, general manufacturing, material movement, and mining industries as opposed to aviation and medical. This is due to the already abundant amount of research that has been conducted in these two areas.

In order to insure our mutual understanding of what constitutes Safety-I and Safety-II, listed below are the main attributes of each:

- Safety-I
  - Safety is defined as few things as possible go wrong.
  - Our driving management principle is reactive. We respond when something goes wrong.
  - Accidents are due to failures and malfunctions. Investigations are to determine causes and contributory facts.
  - Humans are seen predominantly as a liability or hazard.
  - Performance variability is harmful and should be prevented as much as possible.
- Safety-II
  - Safety is defined as many things as possible go right.
  - Our driving management principle is proactive. We are continuously trying to anticipate developments and events.
  - In explaining accidents, things basically happen the same way – regardless of the outcome. An investigation is to understand how things usually go right as a basis for explaining how things occasionally go wrong.
  - Humans are seen as a resource necessary for system flexibility and resilience.
  - Performance variability is inevitable, but also useful. It should be monitored and managed.

Source: Hollnagel, E. (2014). Safety–I and Safety–II, The Past and Future of Safety Management

Please review the attached Survey Consent Letter. If this is acceptable to you, please reply to this email and I will schedule a time that will work with your schedule. If you have any questions for me, please reply to this email at turnerjam15@students.ecu.edu or phone at (910) 540-1865.

Thank you for your consideration to participate in my research.

Sincerely,

J. Allan Turner, CSP
Principal Investigator

Appendix 4. Institutional Review Board Consent Letter

Dear Participant,

I am a student at East Carolina University in the Technology Systems department. I am asking you to take part in my research study entitled, "How is Safety-II Being Applied in Practice and is it Working?"

The purpose of this research is to explore, describe, and critique how Safety-II methodologies are being adapted into practice. By doing this research, I hope to learn how organizations implement Safety-II, how do organizations obtain buy-in from their leadership and employees, what tools and techniques are used in daily practice and how is the success of Safety-II measured. Your participation is completely voluntary.

You are being invited to take part in this research because you've been identified as a subject expert in this field. The amount of time it will take you to complete this interview approximately 20-30 minutes. Interviews will be recorded for purposes of transcription.

During this interview, you will be asked questions that are related to the techniques that safety practitioners have regarding implementation of the Safety-II and to check for the whether the efficacy of this concept is improving safety measures.

Your name and contact information will remain confidential and will not be released beyond my thesis advising committee and the ECU Institutional Review Board (IRB) that will oversee this research. Therefore some of the IRB members or the IRB staff may need to review my research data. Your identity will be evident to those individuals who see this information. However, I will take precautions to ensure that anyone not authorized to see your identity will not be given that information. Your responses will be kept confidential and no data will be released or used with your identification attached.
If you have questions about your rights when taking part in this research, call the Office of Research Integrity & Compliance (ORIC) at phone number 252-744-2914 (days, 8:00 am-5:00 pm). If you would like to report a complaint or concern about this research study, call the Director of ORIC, at 252-744-1971.

You do not have to take part in this research, and you can stop at any time. If you decide you are willing to take part in this study, please indicate your verbal consent and we will continue on with the interview process.

Thank you for taking the time to participate in my research.

Sincerely,

J. Allan Turner, CSP
Principal Investigator

Appendix 5: Transcripts of Interview Responses (by question)

Listed in the following paragraphs are the summarized responses (in bold) to the survey questions based on the interview transcripts. As mentioned previously, there was a total of eighteen individuals identified. Thirteen agreed to be interviewed, one declined due to being unable to secure approval from their chain of command, and there were four non-responses to the author's solicitations. Six of the eighteen identified and solicited were through snowball sampling. Two out of the four non-responses were snowball sampling individuals.

1. How did you sell your leadership on the idea that Safety-II was the necessary process to improve safety?

Respondent #1: **The point is to try and all do the same thing whether it be Safety-I or Safety-II and that is to improve operations, prevent injuries and death, good things happen, etc. So how and where do we find the problems and what is the source of the solutions we tap into. When you look at how things normally work and improve how they work, that is a much better way than if you only look at failure and prevent failure. This is a far more effective way to improve safety**.

Respondent #2: **So that's the hardest part. The first rule in change management is to take the groups from where they are to where they need to be. The first push was toward the worker – give them tools, training and "fix" them to make it better. Safety-II is not a change at the worker level, it's a change at the leadership level. What's really shifting is**

how we view the worker. Help the leaders understand that the traditional programs that we have used so far were used on fixing the problem worker. All of these interventions (behavioral, individual intervention etc.) to make the worker safer. They need to look at the worker differently. The worker is not the problem they are the problem solver. That's the challenge, the paradigm shift and the conversation you want to continually have with leadership. That shift for leaders is not hard, but they are not at the same place where we are and we have to be strategically improvisational with them, post-event, post-incident, etc.

Respondent #3: **Starting 7 years ago I sent by our business to work in Australia. We had bought a business that was not performing well not only in safety, but across the board. After applying our current model, there were improvements and a fall in the accident rates. We got the performance rate down to the best in the group. There were three unexpected, uninteresting, unimportant events for every million hours we worked. From that experience, we began to challenge ourselves about the traditional way of doing safety to begin to think instead of sitting around waiting for things to go wrong, we need to get out there because there has to be a different way of doing this. We looked at what everyone was doing and experiencing, as we were late to this "quest for zero injury" game that everyone else was doing. We looked at our European performance as Europe had been doing it for two years longer than us and it was there that you get a chance to gaze into your future, which doesn't happen very often. We saw a business that was continuing to invest money in safety, but not seeing a return in terms that incident rates were not falling but instead had a slight increase and then had three fatalities in a two year period on**

projects that would have otherwise won traditional safety awards. They had gone millions of hours without lost time accidents or accidents of any description. So this was couple of warning flags to us. One that if we continued down this route, the same outcomes were like to visit us in terms of serious events, and two that our belief that in continually pursuing all accident rates, the small deficits, would allow us to somehow predict all large deficits. And this was huge challenge to our traditional way of thinking. So I had a conversation with Sidney Dekker and asked how do you weaponize Safety Differently theory? How do you get a project leader and a set of tools? So these two thinkings coincided in what economists call a "privileged moment" where the business wants what we had to offer, which doesn't happen very often and they beautifully coincided. They wanted an alternative way of looking at safety. And that was our "in" in terms to persuade a management team that was willing to think about a different way of doing safety. This is not about throwing away everything we have done for the last forty years that it was a waste of time - because it wasn't. But the tools we used over the last forty are not the ones we need to use for the next forty and in a lot of ways those traditional tools are standing in our way. We also looked at disasters worldwide and the same symptoms were starting to appear with us. Do not just celebrate long periods without incidents, instead also be a little bit concerned and curious, because in our experience all of the precursors and ingredients for a fatality are being assembled, but you're not seeing them because all you are doing is looking at the deficits.

Respondent #4: **We did not sell, we enjoined leadership as what began as a safety journey and looked at how others did safety. We looked at other governmental agencies, which have same size, people, geographical districts, type of organization and districting as**

us. Also went to several large commercial organizations. Our entire leadership team participated but not at same locations. They then put their heads together and resonated rules, how did these other agencies put their safety organization together? There were noted punitive actions at one power utility for violating some sacrosanct rules, some liked that. A lot liked the training at another. It was not cultural but technical (entering/exiting vehicle, lifting, etc.). They got a sense from them that there were a lot of things out there, there was a different way to do safety. What drove this was that incident rates were trending up in both ground and air operations and our chief decreed that something was going to be done. Got a push from senior leaders and from our organization as well. It got them on the road to look at other organizations and there was a fun aspect to that. Couple of fatality investigations that led to this that were going on at the same time. One was a helicopter crash resulting in a fatality. Interesting in that there was a crew in a place where they could watch the whole evolution. They suspected something was going to happen because this same pilot had done something similar the day before, and they even went so as far to video the event – but took no action, why? This was due to what was perceived as culturally unacceptable, they thought that they could not offer an opinion due to being in their first year and this was an expert pilot. Then the idea of upward voice was questioned. They next looked at network of influences on this crew that prevented them from speaking up. There was also risk normalization since it appeared to not be so great because the same thing had happened the day before. From that incident, we did our accident report in a very different way. It normally would have been a bunch of labels that would have masqueraded as an explanation, but we felt it needed to go deeper and so we took a systems view and presented it to a senior agency safety and health official in Washington. He

wanted more of this. This opened the door to do something different. So the Learning Review replaced serious accident investigations. We didn't go in wanting them to change everything, but the premise was as an opportunity to learn. The opportunities to learn springboards into an organizational mantra, an organizational espoused and deeply held values. It is not unilateral or complete by any means. There are still holdouts that want to stay with Safety-I. They are the ones we have to reach out to and not tell them they are wrong but work with them to educate. We enjoined the leadership in an educational piece, called Human Performance fundamentals. It was a fun course and allowed them to challenge or not challenge assumptions and to listen to their peers in the organization. It allowed them to save face in a big group as they began listening to one another and opening up dialogue between them. Some views held by senior leaders were actually changed 180 degrees. Safety &Health professionals tenaciously held on to their Safety-I beliefs, but even they begin to listen to operators and mid to senior level leadership that were having this dialogue. They eventually changed because of their leaders view. There may be a Safety-III, where the premise instead is to become a learning organization. As work improves, prevention becomes a function of learning, the metric is now changed. The definition of accountability from our senior leaders is to learn what they can from the event. Following an accident, the organization is accountable to learn as much as they can from the event. That is Safety-III.

Respondent #5: **We don't have to wait until failure to learn. We can begin to analyze any task in terms of organizational weaknesses for management systems that are failed, weak, or ineffective. We can't fix people – training and motivation are useless. In terms of**

errors of cognition, we really have to understand that people will have errors, and we have to be able to intervene before error occurs. We can identify these organizational weaknesses before an error occurs. This is part of a just, learning, reporting, and informed culture. Your next incident is going to happen, but we don't have to wait until an incident to identify what can bring it about. Safety, profitability, quality, efficiency, customer satisfaction are achieved by the same methods. If you are focusing just on safety, you are not going to identify what is unsatisfactory in your organization. We need to incorporate concepts of loss control, not just preventing accidents.

Respondent #6: **I never really tried to sell them. I think building relationships is the number one thing I've done on each forest I've been a part of. I started my career on a national forest in northern California. It was a heavy fire forest and the leadership was very much in line with Safety-I. It was early in what the service called their safety journey. I started in 2012 and came to the organization with a degree in occupational safety and health. I was a new safety professional who was degreed and that was a rarity to have someone professionally trained where most others came along by experience. So that was how it had been year after year, very much black and white driven numbers. I started building relationships in two ways. One was with upper management leadership with our supervisor and deputy supervisor, district line and staff officers. This was so they could get to know me which made a big difference. The second part of that was interacting with the employees, in that some of them had been through the safety journey meeting, but hadn't really embraced it. They had seen a lot of bad come down from the top and there was a lot of repercussions in the past, so trust was one of the biggest things between these two**

groups. After this relationship building had been going on and we would have a minor incident, one of the line officers would come and talk to me about it first. We would talk about some of the ways we could approach this and one was by building that trust with how we facilitate that initial interaction. One of the first things I would ask them to say was not "What went wrong?", but "How are you?" So it brought it to that person pretty direct. In that way of the relationships of how we approach people, I didn't have to sell it, it sold itself. I didn't have to push it and that is very much what made me successful as a whole in this agency by building these relationships over time.

Respondent #7: **It's all the fuss about serious injury and fatality rates, those haven't changed much, lower order injuries have apparently diminished based on recordable frequency injury rates, but we now have a proliferation of occupational medical providers who have proven to be aggressive. So how do we sell? We have transferred the risk out to the lower order injures but haven't changed the way we do things. Have we gotten better at safety or have we gotten better at measuring the symptoms of unsafety? There is a little bit of a spectrum but not much**.

Respondent #8: **What I do is I try to help them understand that they don't understand how work is actually being performed and this is challenging for them and they push back. They don't understand the blue line (work-as-performed). They think they do but they really don't. By understanding and taking advantage of the collective knowledge that people have, such as worker engagement, etc., there are huge opportunities to improve and lead to successful work - which takes you away from safety, maybe looking narrowly at**

safety and at successful work, and safety and health is part of that. This is much broader than health and safety and many leaders find that very attractive. They don't like it when you imply they don't know what's going on and you have to demonstrate that to them. Once they start to see that and they start to understand that there is an opportunity, they find that attractive. To sell and move people toward the New View or Safety-II, you have to do a lot of work on human error, work on other points, and come back to human error. Let them push back on human error and accountability. In the course of doing that in some (not all) cases as a consultant doing New View/Safety-II you can be fairly successful. Really important to discuss the blue line (work-as-performed), engagement, and human error is huge, dealing with accountability, blame, looking at incidents differently, understanding organizational context. Stepping back and looking at the "contain and hold." These are critical.

Respondent #9: **I put things in terms of risk. How I usually move into a client's organization is by giving senior executives a half day seminar and let them know - here is the truth about human performance. My approach is all oriented toward the front-line, the operational side of the business. I make sure that they understand the risk that human error poses toward their assets, operations, and profitability. I talk about the business case for this in that there is a benefit provided. I use the term human and organizational performance and I try to use words that they will recognize, staying away from academic phrases. I talk about the core practices that need to be addressed to manage the risk that human error poses to their operation. I come at it not only from a safety standpoint, but also an economic standpoint but don't necessarily use numbers. I give the participants a**

broad perspective on the rough cost of human error. There was a comparative study in Europe between companies that have an error management program and those that don't and that proved it was much more profitable to have human error management program than not. There is a moral as well as a profitability aspect and then also what is the risk if you don't have a management approach to this. I spell out what this can do for an organization and that usually sells itself. But they must understand that they will have to do some things differently. This is why I get in front of them early, and if they don't want to buy into it after hearing that in the initial half day seminar, then we sever our relationship and don't spend any more money. I make a point with executives that human error is a normal characteristic of being human. I try and convince them that it is really a loss of control. When you look at human error as a loss of control, it makes the risk management problem clearer. That is an important principle to understand.

Respondent #10: **I'm not a salesman. It is a difficult process and it's still not there. I have been working at it since 2011. When I started we had an incident rate of 5.6 and our location is a heavy manufacturing facility. The previous safety function was driven by compliance and since that time have had a lot of turnover in the senior management ranks. We have a total of 78 locations around the world. Our leaders are really sold on focus, transformation and lean, SQDCP, QRQC, The Five Whys, A3's, R3's, etc. And that's their focus. I've had difficulty selling our leadership on the psychology of an organization. So what we actually did was I trained our group which includes environmental and health to the best of our ability on Safety-II. After getting them on board and getting them to see the benefits of Safety-II and the psychology of the system, we decided to shift our mindset from**

the top-down to the bottom-up. If we can't get our leaders to buy in on this, we'll get our employees to buy in. We took that approach with the employees and started seeing change and improvements. It's hard to put that change to a metric and going back to Safety-I, which I think is still the foundation of everything and will still be around. I've listened and I've read, but I haven't really found that anyone that has come up with a solid set of metrics. Everything still goes back to the incident rate metrics. Finding those leading indicators is very difficult. Going back to the original question, it wasn't a presentation or sales pitch. It was a gradual day by day sell the leadership as this is what our employees are doing to help themselves. This is how our employees are getting involved and it really came from the bottom up. And we're still not done. The leadership is actually starting to recognize that what we are doing is working. Using a Safety-I metric, out of 78 facilities, our incident rate is the lowest, our worker compensation premiums are the lowest, and our facility insurance is the lowest. Everything we are doing is phenomenal and we can show those trends in the old manner that what we are doing is working.

Respondent #11: **I work in an industry that is already extremely safe: aviation, specifically air traffic management. We have very little raw material in terms of accidents as there are very few accidents related to air traffic management. We have quite a lot incidents in varying severity in terms of separation between aircraft. A few years ago we came across this idea from our contact with Erik Hollnagel and others in the field: David Woods, Sidney Dekker, Richard Kirk and we saw that there was good potential in this idea to look at safety in a new way beyond looking at accidents and incident and potential accidents and incidents. So we commissioned and co-wrote a white paper which is a**

Eurocontrol White Paper (available for download) and this was just before Erik Hollnagel's book on Safety-II came out. That's how we did it. And we released this white paper which at the time was a very new way of thinking in terms of safety. So we just put the ideas out there and they were quite controversial and by no means universally accepted and still are not. For me, I am a human factors specialist and psychologist. And from an ergonomics and human factors aspect, the ideas were not really new because in human factors we stood in normal work all the time, that's what we do. We don't just look at incidents, we're trying to improve how the work works, so for me it was quite a natural fit with how I thought about human factors and design. How we actually sold it was by this white paper and by a number of conferences that we organized. They were actually aimed more toward front line specialists than leaders and that influence has been more gradual.

Respondent #12: **Going back to 2003-2004 at a time when the company was struggling economically and we were in a survival mode. The company starting looking at lean manufacturing after a series of layoffs as to how we could operate the factory with less people. I was one of the first lean engineers assigned to this facility. In the discussions about manufacturing operations in this environment, I kept bringing up "Can we do this safety?" And after six to seven months of challenging that team on this, the plant manager comes up to me and says "I'm going to make a change. I've been hearing about how aggressive you've been about safety for the last six months and I'm going to make you the plant safety officer and pull you out of the lean group. However, I want you to stay on them just like you've been doing, but now you're reporting to me." He and I had a lot of dialogue about how severe injuries affected us since at the time, we were operating in the red and how**

would that impact us moving forward. The strategy we started at the time was how do we get the employees engaged and that was when we started building safety teams. The team concept opens up the ownership. There were several books we had read and were applying in that era. One was Stephen Covey's *The 7 Habits of Highly Effective People* and Scott Geller's work on *Behavioral Based Safety* surge he had in the 80's and the work he did for Domino's Pizza. From that perspective, leadership really understood it and said we had to change from being a disciplinary or just a structured safety policy and started reaching beyond that to figure out how can the employees start helping us with safety. Employee engagement was a fairly easy sell at the time.

Respondent #13: **I didn't have to do that, it came from our division that this was the direction they wanted go in and for the past year and a half, that's where we've been headed. I have worked with the leadership on implementing these actions, and have engaged quite a few people to make this happen but it not being driven from the plant safety department, instead by the division vice-president, engineering manager and safety manager. They got together and developed these Safety-II related processes. Additionally, the use of the HIRA (Hazard Identification and Risk Assessment) tools is being driven at the corporate level and there is also a huge emphasis on Management of Change**.

2. As the S&H Professional in your organization, what did you do to get started implementing Safety-II?

Respondent #1: **As a consultant you are trying to address the specific needs of the client, but in general, I try to get myself and they get out to learn and observe normal work**

to see what is actually happening. I try to equip managers and safety professionals with tools like Learning Teams, Gemba Walks, Debriefs, and a "Day in the life of" where the leaders actually get out and work with the workers. Get out and figure out what is really happening. One client was trying to improve their accident investigations. We used Learning Teams as a foundation and what we did was not start with what failed but describe what normally happens and describe that first. By simply describing actual work-as-done, a lot of times it makes sense as to why the failure occurred. People will be skeptical with this approach at first, but after going through it once, they are generally sold. I also try and include the workforce and get them involved. We are giving a voice to them and to how work is actually happening. This is a process in getting the managers to look past blame and rules and get to what actually happened. The more I do this, the blame factor is used less and less as they understand more and more as to how work is actually done.

Respondent #2: **This was a little easier story for us as we had a new facility. One day a gentleman came to my office and he told me there was a new way to look at safety and I would really like it. I was sent to Institution for Nuclear Power Operations (INPO) in Atlanta, GA. And was introduced to Human Performance – this new view of safety. I'm not sure I would have done this if it had not been thrust upon me. This was over 20 years ago. This was well before Hollnagel. I used Dekker's Field Guide to Understanding Human Error (1st edition). We were already working on these program when this book came out and I had all of my leadership read it**.

Respondent #3: **We took a couple of very different ways as this was first time we had done it anywhere. We took a traditional route of top-down and so we engaged with senior leadership immediately and had a retreat with Sidney Dekker there. We were really getting in amongst them, baiting them, irritating them, making them uncomfortable and inadequate and challenging them around the assumptions we had made in safety that if we don't have any bad accidents, everything is well. Well, we had personal experiences that was not true. We were challenging them around the assumptions they had made in safety. Does work get done the way you imagine it to get done? Does the methods statement match what is being undertaken by the workforce and is what they are doing unsafe? Whose definition of unsafe are you using when you give them that authority that balloons into this accountability after an event? When eventually you got down to the workforce, work as delivered is very different to work as imagined. So in Europe, when we started doing this two years ago, we did it bottoms up. We engaged with the delivery part of the project first because it was the most expeditious way to do this. Europe was coming out of a recession and business leaders' time was focused on getting the business fit again and it was harder to get their time and attention on anything other than getting the business going. That was not going to stop us. We had the approval authority but hadn't much time understanding this other than it works in Australia. So we approached the projects and asked them: what is the dumb stuff we do get you to do in terms of safety, where is the bureaucracy that makes no sense, what are the practices that just irritate you and how can we make your life easier when you struggle, and what do you need to be successful? Also what are the micro-experiments you'd like to come up with as a project to challenge the existing way of implementing safety on this job? Over the years, we accumulated a series of micro-**

experiments which then changed the way that we work, we changed the management system and the metrics and other things and eventually this bubbles to the surface and appears as a very interesting set of concerns as far the leaders are concerned. We sat down with them three months ago and they said nothing is happening, this Safety-II, safety differently stuff, nothing is going on. We thought they weren't serious. We asked them to look at the project dashboards that show this project activity, these micro-experiments, all these things we've incorporated in to the work stream and they said we never seen them before, we didn't ask for them because there is nothing going on. One thing in dealing with managers was that if they hadn't thought of an idea, then nothing was happening. Their measure of activity is based on the number of ideas they came up with. When in fact hundreds of ideas are coming up from the shop floor. Those two approaches are diametrically opposed. If I was given the choice again I would approach the senior guys in Europe almost to the extent we engaged with them in Australia. That approach starts to build the trust you need with the workforce to make this work. That trust we get is by leadership involvement. They find it difficult to stray away from the command and control regimes that they have been using. Actually far from needing that top end support benefits from that it not being present sometime.

Respondent #4: **A big part of shifting the organization is also getting the safety & health professionals to realize that everyone that surround them, the field, senior and middle leadership, that everybody wants the same thing. The key is to understand Safety and health are not dealing with black and white issues but dealing with the principles of becoming a safer organization. I don't like the word safety, prefer the term safer. As we**

enjoin our people, we must agree to some principles of operation. When we brought all our organization together, we first assumed that all people are doing the best with what they have. The next principle is that we will do no further harm to our system or the people within our system. Another principle is that we will not create something in the report that doesn't further leaning for the organization including the language in the report. We have to develop the skills to think in the moment and ask better questions in the moment. We must get away from having a sense of control in a complex environment.

Respondent #5: **There are five steps in managing safety in an organization: The first step is compliance. In some areas of the world, and with varying levels of safety maturity, just getting compliance to regulations is the first step to safety excellence. The second step is behavior. The United States tried employee based safety usually in terms of behavior based safety. This was a general failure mainly because of the energy required to sustain it and the focusing on unsafe acts by the employee. European models had more success since they focused on the management and sub-culture systems and building safety around the employee. The third step is management systems such as OHSAS 18001 and ISO 9001. This started to build a consistency. If we do this things this way we can get expected results. The fourth step is culture. This is in terms of understanding an organizational consistent interpretation of a situation that leads to norms and boundaries for thinking and action. If you have an organization and don't have processes in place to build consistency, then you are letting people work to their own set of standards. Lastly we enter the fifth step which is Safety-II. This is looking at safety from a different perspective. It doesn't mean we don't do the previous four steps, but the safety-II concepts need to be integrated into these concepts.**

In the past, we were trying to prevent the major incident. Now we are trying to build an organization that can respond to pretty much respond to anything.

Respondent #6: **In addition to the things talked about in question one, it was also about learning this organization which is unlike any organization I had every worked for and is also one you can't learn about fully. It's a decentralized organization that has centralized parts to it. Each forest is its own independent little framework and that's based around the communities they interact with. It is based upon the leadership that's there and it's built on tradition. Traditions are very big in this service and with that you get a lot of pushback because of that. If it hadn't been for my past experience working with this agency while in the military, I'm not sure I would have initially been too successful. But I understood those traditions pretty quickly and it was very much the same as what I had with the Department of Defense, in that traditions don't usually move and I think recognizing that piece was very important for me. I had to work within the existing framework and that change was going to be very tough, but not impossible and that it would take time. It was continuing to build trust and relationships**.

Respondent #7: **It's having the conversation and really selling leadership and getting started implementing. In practice, it is some awareness and orientation level classes on Safety-II. The concepts of people as a source of resilience and not as a problem. I have to build a little understanding. Most of my clients are in downstream environments such as refining or petrochemicals and they are very Safety-I. So even to sell this to contractors, as they know what it's like to get rid of good people who make mistakes. Plants have their**

golden rules, like the 1st time you violate rule, then out you go. When you have contractors going in and out it's a conversation about incentives, They'll try and do a good job and take cues and guidance from plant operators and there are times where they are set up to fail. It's about how you frame it. We have to convince the leadership that punishing people for things they do all the time is not correct. The plants can create an added cost burden by singling out their employees. Look at how your incentives line up and if you try to manage an action orientation instead of managing softer then your hands are tied.

Respondent #8: **In most cases, its thinking about investigating incidents and failure differently. Thinking about blame differently. Number one is transitioning incident investigations so that we start to learn from incidents and not just blaming people and wasting organizational resources by inappropriate investigations and recommendations. If you can get the organization to implement learning teams, they are highly effective and highly influential with the organization. This is because it is not just a bunch of safety people saying what is going on. When it is a bunch of workers saying here's what we're up against, what normal daily work is like and what we think you should do about it, and that's communicated to high levels of management directly and unfiltered, and not in PowerPoint, it has a huge effect on leaders. This is one of the most important tools and Safety-II is not just about them. However, my colleagues and I have found that learning teams as a whole have been very influential on organizations. Some of us will simulate a learning team with leaders as part of our initial training when introducing the New View. They then at least get a taste of it and takes it past the conceptual. You are changing the relationship between the workers and the leaders which is incredibly critical. You are**

changing the leader's perspective that "if everyone would just follow the rules, everything would be okay." You are creating this powerful feedback channel that didn't exist in the past. These are huge systemic changes that if you can figure out how to institutionalize, can have a big impact.

Respondent #9: **Presuming that the client's executive team wants to move forward, it is a good idea for one of the executives to be the resource manager or champion. This is a person at that level who buys in. The first thing you want them to do the very next day is start managing the risk. Target your high risk operations and start identifying critical steps in those operations. One of the topics I talk about in the executive seminar is critical steps. A critical step is an action that if done improperly will trigger immediate, irreversible, and intolerable harm to one or more assets. Like putting the finger on the trigger of a firearm. Take action to make sure you have positive control at those critical steps. This is straight forward and readily understandable and most of your front line personnel already know what those are. Many of these steps might be missing from the procedures and those you want to target right away. Also, the managers have to start changing their language and this is a long-term process. There is a vocabulary that goes with human and organizational performance and I always remember in a conference that Karl Weick speaking on his book *Managing the Unexpected*, said "if you want to change the way you think, change the words that you use." If you start using the words of human and organizational performance, then you need to start changing the way you think. So, first manage the risk and managers should force themselves to use the terminology. You also need to be clear on where you want to be, usually this is in terms of new behaviors for workers, supervisors and**

managers. It is not just a front line worker issue. You have to start aligning the organization to support the new behaviors and eliminate anything that encourages an old behavior. I have seven principles that I talk to the executives about. The first principle is people have dignity and you have to treat them with respect, honesty, and fairness. You must look at your workforce with a sense of dignity. As a manager, if you know your boss, you will start paying attention to what your boss pays attention to. The boss will have that expectation of their managers. The boss will start to use the language and if he or she asks you what the critical steps are, you had best know the answer.

Respondent #10: **For me personally, it was teaming up with another safety professional that has bought heavily into this and from there I started studying it and I can't get enough it. This is Hollnagel and Dekker's writing and including books like Diane Vaughn's *The Challenger Launch Decision* where she talks about the "normalization of deviance." Also, the works of James Reason, Malcolm Gladwell helped. I studied sociology, economics, psychology and their environments. From that it starts to make sense and Safety-II emerges from that. I can relate the story from Gladwell's *The Tipping Point* about getting rid of the graffiti from the New York subway system to our program and what we were trying to do and things we wanted to do, but just couldn't get over the hump. Keeping all that in line with what we want to do, reading about what other people have done in these circumstances and just trying new things. Bob Edwards called it "Try-Storming" in his talks on "Solving the Unsolvable" and finding out what works for you. Try-Storming is a combination of brainstorming and trying it at the same time with mock-ups of a system to see if it works. That is a process we do. We drive it with the employee's first. We started an**

employee safety committee and began monthly training concerning Safety-II and socio-technical topics and how they interact with their environment and what they can do to improve their environment. Slowly, we have started to see a culture shift to the positive concerning Safety-II. It's amazing to watch these folks come up with the goals and corrective actions to whatever it is that they are doing and are building that capacity and resilience for themselves. It doesn't matter what department – they are driving the practice. We are still far from perfect but from where we've were to where we are now, the difference is like night and day.

Respondent #11: **Same as the answer to question one, we published this white paper and that was the first step, a bold first step in showing these ideas to the world. Since then we have had a number of conferences, one recently in Belgium, the details of which are available on the internet and we also have courses in systems thinking. I led a second white paper on systems thinking for safety which was more about distilling some of these core ideas and attaching some practical advice to each of the ideas we associated with moving toward Safety-II**.

Respondent #12: **What's really important in implementing Safety-II is to get people on board to what Safety-II is and I'm referring to a proactive system and with employees being involved. You have to first identify and properly train the subject matter experts in the facility for the safety teams. Ergonomics is one example. You have train them on how to do the risk assessments and take a proactive posture to queue them up for success. You have to make sure they are the right person, are they interested, and have the right**

interpersonal skills. Additionally, starting at the top we are making sure that all of the plant staff (senior leaders) understand what Safety-II is, that this is going to be our approach and our journey. This is not a once a week walking inspection. So the leadership has to be trained, understand, and engaged with the process. You have to understand what your organization is and what the key things we talk about are. First, who are the right people? What is the purpose, vision, and mission? What are the regulatory requirements? Lastly, what are the corporate and divisional plans? You have to start by defining what kind of structure you need and providing the leaders of each element of Safety-II team with the proper training and management.

Respondent #13: **It starts by meeting with the leadership and engaging with plant operations. Operations ultimately ends up being involved in a lot of what is going on. It is identifying resources and a clear understanding that the safety department should not identify every hazard in the plant. That has to come down into operations and you have to have programs and systems in place to make that work proactively. There is strong engagement with the plant manager and plant operations manager. Ultimately, they have a responsibility to report back to their leadership on the status of the plan that is developed within the facility to address these issues**.

3. Do you feel that your upper management, as well as your management peers are on board with Safety-II and are they actively assisting you?

Respondent #1: **At a conceptual level I don't get not much pushback. Where it starts to materialize is when you pin them down to action and tell them that you have to get out**

from behind your desk and go see how work-as-done. They just see this as one more thing to do. Also, when I tell them we need to take the focus off of blame, I get pushback – for example, we give them PPE, why can't they use it, etc.? I deal with these two issues first by working with the upper management team to make sure the supervisors' schedules can support this additional tasking and try and take something else off their plates to free up time for this. I understand they are all already very busy. For the blame thing, if at the end of telling the story as how work-as-done they can show that the employee is still "blame-worthy" and that blaming them actually makes performance better in the future, then go ahead and do that. They often can't get over that hurdle, so I give them space to blame in certain situations but generally over time, they end up doing less and less of it. Our role as safety people is to support them and make it easy for them to take on this additional tasking to manage these processes.

Respondent #2: **Ebbs and flows. Leaders are good about talking new safety until something really bad happens and tend to go back to their old ways. So it is an iterative process. You continually have conversations and you continually show improvement. Problem is we don't have a null set and if we're good at Safety-II nothing happens. We have this challenge that when we use these new ideas and nothing happens, when mostly nothing happens in the old way. Have to be really ready for leaders to fall back to the old ways and when they respond emotionally and want to blame, they need to do this in private. They need to think about deliberate strategizing about what they want out of this event**.

Respondent #3: **I think it is a mix, you have senior guys who really get it and see it as not only a way of delivering safety on it's on, but it's a way of thinking as a more efficient business model. They see this as work as opposed to just a safety approach. Modern organizations can no longer rely on tools and processes that served enterprises in 1910 and 1920 that are no longer valid in the 21st century. There are others concerned about relaxing control and not knowing everything that's going on and that's coming back to the leadership model where someone is expected to know everything that going on and they see that not having that control as a weakness. The difficulty lies in where something unexpected and unwanted falls to your way of thinking, so your reaction is extremely important in moving this forward. Having said that, there are leaders who absolutely get it and excel in this area, who are more than willing to give up control and recognize that their success is very much based upon the success of those that work for them, rather than on controlling and constraining them. There is a broad spectrum. Everyone philosophically accepts it. No one challenges the ultimate aim to empower the workforce to make day to day decisions, but they come up with lots of excuses: "the regulator makes it difficult," "the client makes it difficult." So you have to pick your way through those difficulties and the way is by a narrative and then showing people and instead of showing more counterproof. You have to talk people through these solutions and show them. I made a point of taking individuals out and walking jobs with them examining work-as-planned/ work-as-done. So instead of going up to an individual and ask why they are not going through the method statement, have a discussion about why they are working the way they are. Why does it make sense to do work this way and how have they managed the gap between work-as-imagined and work-as-planned. Engage with them that way. What in the method statement**

makes sense and what doesn't if there is one thing you wanted the person who write the method statement to know what would it be, how would you change it? They go away then with an impression there is a big difference between the ways we actually get people to work and the way we imagine that they go to work. So if there is a gap between in everyday activities around steel fixing and pouring concrete, what is the gap like that in high hazard work, in lifting and confined space entry? If there is a gap there we need to know about and simply telling people to follow the rules is no way to close that gap. You tend to pique their curiosity and we find that way works best.

Respondent #4: **Yes, and no: some are, some aren't. Some still hold tenaciously to the concept of punitive actions because they really believe it works. It takes time to shift to a culture of inquiry. I looked again at Erik Hollnagel's list of Safety-I and Safety-II principles and as I did, there is no question that there is space for this discussion. I believe that Safety-II is still a first step in understanding rather than managing. Part of this is also developing a peer to peer dialogue, getting senior leaders on board and understanding that our people are operating in a complex environment and all information will never be available to them. So they are making decisions and taking actions. They are doing the best they can with the information they have. We want to change/improve the conditions under what people work in and so we want to focus on that. When we do that we are moving into a learning space and we learn about the influences. To err is human and we can't change that and trying to very Safety-I centric, but we can change the condition and then we move to a learning space**.

Respondent #5: **Absolutely not – Most safety people are the problem. We have for so many years fed management the story of what safety is. All they care to look at in safety is the one PowerPoint slide with the measuring accident graphics. We created the environment that safety is all about measuring accidents. Colleges and CSP curriculum are not teaching people to look at safety differently. Safety people have been trained to an elementary aspect and not looking at the new age of safety. Fixing the safety people to understand this is the first step. I do not care about incident rates as they tell me nothing about how your organization functions. We are making hundreds of thousands of risk based decisions daily, yet just focus on the occasional incident. Observations, assessment, implementation design, and feedback to see how people are working through the five steps, then that is how you have to get past the current view of safety and into looking at safety differently**.

Respondent #6: **Hit or miss, it depends on that leadership role. In my current role, I work nationwide and I work with local forests periodically but also work with the senior leadership of the organization too, and they all have their different opinions and that part of that tradition of how they grew up in the agency. A lot are ready to retire and they don't want their "boat moved," are very happy in the harbor they're in and not willing to head out to sea and battle some of the storms that come with this. But there are some that are advocates and they are battling this and they are actively looking at how they can also assist the agency. The agency has one of the highest accident rates in the federal government. We also have several fatalities a year, and because of that they see the harm that is happening to our people. For me it's my personal story – I was injured on the job**

when I was on active duty and in the civil service as well. I like to share my personal story to bring management peers on board to show how I was affected so they can understand that personal feel, that it's not always just business, but there is a piece that it's people that they're heavily involved with. The diversity of this organization too is very unique in that you have firefighters, but you also have what we call "ologists", and that can be a wildlife biologist, a fish biologist, an archeologist; very science background folks. Those aren't the folks that get injured the most, but those are the ones that get forgotten about a lot. Also includes our business management folk – human resources, budget and all of those types. They get forgotten about in the process because we are such a fire-driven organization.

Respondent #7: **Within our organization absolutely, our principle has much more experience in safety than others and he is the one supporting us to go out and evangelize Safety-II. Clients however run the spectrum, some embrace it with open arms and others this is not what I need to do to stay out of trouble with OSHA**.

Respondent #8: **When you meet with leadership, you have to design into your training opportunities for them to push back. All of us can learn best if we have a chance to question or disagree with what we don't like about what is being discussed. For example, you are saying that no matter how people mess up they are never held accountable, etc. You have to recognize that some of the leaders get it and some don't. There will be this uneven implementation and support because everyone's on a journey and they are all in different places on that journey. You have to take that into consideration and we just have to help people move along. This applies to middle management too, as they are influenced**

by their boss. We have to give people a chance to gradually learn this stuff. When you have an organization that doesn't do that and when one leader really gets this and decides to immediately implement it without further discussion, before everyone else gets it, and hold the organization accountable to make it happen, that's when the process falls apart. It fails when everyone is forced to do things a certain way. The ones that are successful are the ones that say let's go find managers and supervisors that do seem to agree with this and let them try a learning team in their area. From that you let it grow organically within the organization.

Respondent #9: **They have to be. This is why I get with the executives up front and they have to realize that they have to do some things differently. This is not a program for the front line workforce, this is a way of doing business, and this is a way of thinking about work in their operations. It's not just the workforce, it is everyone. It is very important that they understand it**.

Respondent #10: **They are coming around. When we have an event or accident, they are quick to go back to the question "Is it a recordable?" That's what they want to know first thing and that is pure Safety-I. On the positive side they are very supportive of not "blaming and shaming", but trying to learn from the event. During a recent event an employee received a chemical burn on their foot and was not wearing prescribed PPE. Turns out it was a small amount of a caustic chemical that had to be added to the process and the operator felt it would take longer to suit up than it would to just add it. Rather than just look at it as the operator's fault, now we are able to show all of the systemic**

pressures this employee was under and these are the reasons why he made that decision. With our leadership, we have tried to use terms that they understand. Executives understand money. Once I understood that, we started blending the Safety-II references and terminology with terminology that they understand: Lean, Six Sigma, etc. And once we started incorporated that what we are doing is building capacity and saving money, they started to come around.

Respondent #11: **Upper management probably have very less visibility. They are still not very interested in it. It's more been about reaching the safety professionals within those organizations. Safety-II typically speaks most directly to front-line staff in my experience and they accept it almost immediately because it is a very realistic view about their work. It's harder to swallow for some safety specialists because they're caught up in a compliance regime. Most of their work is determined by regulatory requirements. So that pushes what they can do and it doesn't leave much time to do much else. The upper management, many of them are still fixated on numbers, especially on number of incidents and so there still is some way to get to them**.

Respondent #12: **Time will tell, so far the management of this facility understands how serious we are about safety and we are currently defining how they will assist me. Each plant staff leader is assigned as a sponsor to a safety team. That team could vent their concerns to this member to make sure they were being addressed at a high level. This is a great way for upper management to be involved. I feel this is critical and that keeps them actively involved. The other part of making those assignments is to make sure that**

member is appropriately assigned to an area that matches their expertise – engineering, procurement, etc.

Respondent #13: **Yes, they are definitely on board. One thing we did this past year was we re-wrote our whole job safety analysis (JSA) program and process. We amended the JSA form to include a HIRA (Hazard Identification and Risk Assessment) rating for each line item on that form. The plant owns that JSA program. Earlier in the year, a couple of our dedicated safety events included HIRA evaluations on material handling and another event on identification of ergonomic issues. For the items from those events that were identified with a rating of forty or higher, the responsible departments have responsibility for performing additional risk assessments on those items and solving, correcting, and eliminating those hazards**.

4. How are your employees empowered to have a voice in their day to day activities?

Respondent #1: **You have to intentionally empower them. When I hear from clients that "our employees are empowered to speak up, to bring up concerns, and stop work" and you ask them how they are empowered, you hear "well, they just are". If you are not getting out there to get the information and providing them the tools and support where they can bring up where they have concerns, issues, and goal conflicts, they are not going to do it on their own. For employee empowerment, managers need to go out and ask the questions, create space for that to happen. If employees have to do this (on their own) on top of whatever else they are already doing, it won't happen. The manager-employee**

interface is the key. One client created "Smart Teams" where anyone can meet once a month to discuss any issues. Engineers come and present their ideas and plans. Employees can express their concerns and in a culture where it can be freely be brought up. Create an environment where people have a voice. There is a sustainability piece to this and sometimes it falls to the wayside. It is a function as to how much that this process gets imbedded into their routine. By creating a new pattern of workflow to allow these actions to be put into the work stream, it allows them to happen continually. Anytime you create change you create conflict, and it takes a lot of force and pressure to make sure this happens.

Respondent #2: **One of the things I think is valuable. Employee engagement or empowerment so is somewhat chicken and egg. Employee empowerment is pre-potent as to how leadership sees the employee. It is hard to engage the employee if leadership thinks they are the problem. If the leader sees the employee is necessary to improvement and thinks they can solve the problem, it is a lot easier to engage the employee. OSHA's Voluntary Protection Program is a good program to help shift the worker toward problem identification and problem solving. Sometimes they are cursorily included in planning or are rewarded if they don't get hurt (which is not good). You have to help the leaders understand that the Safety-I view is old. You have to help them get to a new level by showing them that there is a new paradigm and once they are enlightened, they tend to move forward**.

Respondent #3: **So they essentially now, they manage the risk that they stand in the middle of every single day. They are the ones who will write the method statements and generate the risk assessments. They are the one who essentially decide how they are going to go to work. They plan their own work and they decide how they are going to tackle it. We have safety committees on site that are run by the workforce and they interrogate the management: "why have you not done this for us, a couple of weeks back we requested this and it hasn't happened yet, why is that?" As opposed to management top-down, manipulation of statistics, questioning why we are not as far along on the work. We require that every time that we have an interaction with the workforce – a toolbox talk or a pre-start meeting, that 50% of that meeting has to be dialogue from the workforce. It can't be the foreman standing up and stating "here's the weather, here's what we're doing, any questions? No, fantastic then let's get on with it." We started at 20% and that wasn't enough, so we went up to 50%. If supervisors are unable to engage with the workforce where they won't give you their views, then we will work with those supervisors on those communication and engagement skills. Because it is not necessarily something that comes naturally to them. And we go through all day and everyday re-writing the risk assessments and the methods statements, scribbling all over them and at the end of the day and come back and say this is the way we planned to do it, this the way we actually did it and is there anything significant in terms of the gap that we closed today? Because if there is, let's go back and change the method statements, let's talk to the oncoming crews, let's discuss how we're going to do things. The other way we've tried to influence workforce involvement is changing the way we induct people. Induction used to be a three or four hour torture session with 200 PowerPoint slides. Ours was no different than any other similar**

construction business but we did it in our own way because the law said so, but they weren't getting anything new. So what we did is - this is the first time we encounter people, how can we make it clear to them that this about them being curious and making decisions? So we give them a choice about how they want to be inducted. The choice is you can have the 300 slides or we can sit down here and have a discussion about the risks individually and collectively you bring to this project and a discussion about how collectively we're going to resolve these particular issues. From there we'll go out to an observation deck we've built on most of our jobs and have a look at where you're going to be working, which is not typically done – it's usually in a classroom session. Now that you've seen it, what extra risk dimension does that bring to you? And you start to talk about even before you begin work, you start to discuss how effectively you can solve the problems they are about to face. We've gone back to those three groups – the ones that have the 300 slides, the ones that have the risk discussion and those that didn't have a choice. The group that didn't have a choice there was no change. The group that chose the slides, they are more likely to raise points of discussion and ask questions about established ways of working than the group that had the discussion. Simply because we gave them the ability to make a decision even though they chose the traditional route somehow prepares them to have a discussion a little bit better. The group that chose the discussion well they are just awesome, you go back after a week and ask them have you seen that enacted across the site, do you find supervisors are willing to come and talk and they reply "absolutely, yes." So you get this spread of inquisitiveness and depending how early you introduce people to the notion that we are different, we do safety differently on this site. So at a very early stage the employees become comfortable with the notion that they have a

contribution to make. We had a really interesting episode in Australia. The induction session was laid out for about 100 people. The guys came in and turned the chairs around and had their backs to the presenter. This was a signal that they considered the next three hours to be ridiculous. What was astonishing was that the presenter went on and delivered the presentation and they signed the register on the way out and this was terrible and what we've come to.

Respondent #4: **Yes they are and there are individuals within the organization who do not believe that is a value in certain circumstances, so leader by leader we have to chip away at it. A field supervisor may believe that people must be held to certain requirements and bounded by these rules. Next step by dialogue is questioning the veracity of the rule. It is not the rule but it is how you apply them. Quality of the rules and the idea of rules is questioned, so the organization moves to more of a doctrinal approach. That is how do we apply the rules to the situation to create safety? Safety is created by people acting in the field not by the rules and procedures themselves. It depends a lot of the leader and their perception of safety. It's the leader asking the question individual perception of themselves – if they are confident and self-assured, getting information from others is part of what they do. If they are timid or feel they are thought of as supposed to have the information, then the questions don't get asked.**

Respondent #5: **Bridging work-as-imagined /work-as-done; I have taken on the worst performing organizations and began to notice that the technicians have a way to understand what is and is not working. You have to give them an established limit of**

authority/actions, but also give them flexibility and the ability to adapt powerfully and effectively, but not to the point of violations. Once you give them that empowerment to fix things, it starts to become very effective. We started to build a "Take 5" program that really breaks down what is the task, sub-task. What could go wrong with this activity and what are we doing to prevent this from occurring. This is human performance at the employee level. At the end of the task, ask the technicians: how could we have done this task with better safer, more quality, efficiency, what tools or procedures need to be improved to make this necessary? A lot of technicians have a lot of great ideas that are best practices, but you have to give them that voice and recognition. I found out that once they take ownership, they want to make it improve. There are hundreds of stories to back that up. How do we use them to create success? We don't point at what could wrong, but give them a voice in what can go right. Using James Reason's culpability model in analyzing and incident, you will find that even in the case of a "violation" the majority of the problems will go back to the management system and not the individual.

Respondent #6: **This is really a unique question for our organization in that there are different hierarchies within it. The fire organization is very much like a military driven organization. You may have a superintendent on a "hot shot" crew and that position is very much like a commander essentially and they funnel down to their assistant superintendents and they funnel down to the squad leaders. Those squad leaders then have three-four people under them. First, they are firefighters and are not going to want to speak up and there's a couple of reasons for that. First, they are hired on a temporary basis and they may be seeking permanent employment. Fear of retribution is the other part of**

that. There is a function within the agency that allows them to pull a safety card and say this is an unsafe situation. We don't hear about it getting pulled very often at these lower levels within the organization. But we do hear about it in the mid-level organization pretty regularly, and that would be those superintendents saying this is unsafe for my crew and turn down that assignment. The rest of the agency is a little bit more open to speaking up and being empowered with these empowerment cards to say this is an unsafe situation and it gives them that voice. There is a little bit more trust. There is still that piece about the temporary workforce wanting to get a permanent position not speaking up and that is most prevalent in our fire organization. But I would say that since I've been part of the organization that people have been more empowered each year and more willing to share their stories, they are seeing that there is not retribution like there was in the past. And as we get new employees within the organization and as they move up within the organization, they are showing that that trust is being built. I imagine that we have many years to go before we get to a really comfortable range, but it has definitely improved drastically just since I've been with the agency. We have also written a document that we provide to our contractors after similar incidents with them where they previously were unaware that they could turn down assignments. We tell them that they need to put their "macho" away, you need to be able to speak up. Our fire organization is very ego driven, stating "I can do this" and our organization as a whole is a can-do organization and people turning work down is very tough for them and that goes back to that tradition piece. That is tough for us to capture because we do integrate with other agencies and the whole contracting side that is paid on performance – so if they don't perform, they're not going to get paid.

Respondent #7: **We work with a lot of management systems like ANSI Z10, we can't defend not using one. Engagement is a large part of that process, and we have to get a lot of direct engagement with employees through focus groups, risk assessments, hazard analysis, and incident investigations. It is difficult to change manager's behavior (just like it is changing line employees) and getting them out on the production floor on a regular basis is hard, but we encourage it anyway. The real benefit is to give the employees a forum where they can voice their concerns. There are those that in their mind bypassing the procedures is them seeing a quicker way to get work done and not being aware of the risk or the control that was intended by the procedure**.

Respondent #8: **It goes back to the original leadership point to understand that the workers have some incredibly important information that they need and they don't have to give it to them if they don't want to. So we have stop thinking that our job is to walk around and boss the workers and we have to realize our job is that we have to learn from the workers and share information with the workforce. To get started, you have to almost go to the extreme of trying to learn from the workers: help me understand how you do your work, help me understand what the problems are here, help me understand the barriers and others things that make you mad. We have a whole list of questions that we can ask around these things. We have to demonstrate to the workers that we are really interested in what they are doing. That's why learning teams can be incredibly helpful as this gives them a forum to discuss these things: how they should be changed, improved or this is what is making work difficult**.

Respondent #9: **Two ways that I promote. It is very important that there is a learning aspect to work and feedback at the end of work. I encourage managers after every high hazard or high risk activity there is a post-job review or after action review for approximately fifteen to twenty minutes to discuss work-as-done versus work-as-imagined. What made this successful regardless of the procedure, preparation, or work situation? I am a big fan of Hollnagel's philosophy of learning from success as well as learning from failure. The second is that I want to encourage managers to get out of their office and spend time on the shop floor watching work as it is happening to get observation and feedback. Managers need to get out into the workplace and create what I call positive experiences for the frontline workforce. The worker needs to know it is ok to say that I almost made a mistake at this point in the process and this is what could have happened, and this is what I did to avoid it. You have an engagement which is two-way learning. The manager gets feedback on how his or her system supports or impedes safe performance, and at the same time the frontline worker gets feedback on their performance. So it's a two-way street. You want to create a positive experience for the worker. I believe in positive reinforcement and managers have to be explicit about giving positive reinforcement for reporting. That is a new behavior for workers**.

Respondent #10: **This is what we started with, our employees. When we first started this, our employees didn't have a voice. This is a very old company and this facility has been here since 1968 as well as a lot of the machines and the employees. So we have a lot of "This is the way we've always done it here." There is a deep-rooted culture there that we are working to overcome, but once we convinced them that they do have a voice and they**

do have the power to change the culture and make a new way of doing things here. And it's up to them to do that, so we came up with what we call a SOAR (Safety, Observation and Action Report) card. It's for reporting near-misses and hazardous situations. The key to it is, you noticed the hazard and what you did to correct the hazard. Once we got that going, they are telling us about all kind of things. It is their corrective actions and they own it. Once we got it going, our entire corporation adopted it as a best practice, wrote a standard about it and now everybody in the corporation is doing it. This is what we are doing as a leading indicator – how many hazards were corrected. Last month we had 243 of these. This is not a new program but have put our own twist on it. What we've started moving into now is to a lot of hazards you don't see, which are systemic. They could be conflicts between work instructions and procedures. Once you start recognizing those and the stress on a department or a flow, start identifying them. For example, this process specification doesn't match what the work instructions are telling me to do. Those are the things we need to know about so we can get those to the right people, be it tech writers or certification engineering, and identify that there is conflict within our policy, procedures, or specifications. We let them know this is causing stress within the departments themselves, and that action has started to work for us as well. This took off faster than I expected and we are constantly in meetings about process updates. We are using the learning team methodology so that when we are writing these processes and procedures, the employees are present. It's not just certification engineering doing these. We are trying to bring the blue line (work-as-done) and black line (work-as-imagined) together and there are certain regulations we have to follow by law. We work out how we can modify those processes to meet those requirements. Same thing with our work instructions and we are

using that process just within the local process to make corrections. I am amazed at how this is working and how quickly this has taken off. I am actually seeing engineers down on the floor now and making sure that a part can indeed be bent, riveted or spot welded like they wanted. They are on the floor with the employees, building those relationships and I am amazed that it is working and the fun part of it is while they certainly understand the benefit of this, they don't know that little by little how this is working and working well.

Respondent #11: **My contact with line employees is through workshops and observations. Primarily through workshops is how they are able to raise their voice. What I have done is I am responsible for a very large safety culture program which involves both psychographic and ethnographic research. In the workshops we are essentially talking about the Safety-II concepts. We're talking about employees being field experts and tradeoffs they have to make, and compromises and resources such as strapping and equipment. So we're just talking about normal day to day work. That is an older concept of safety culture being used for this purpose. And that enables them to have a voice both in terms of whatever they say in the workshops - which we are then able to report back to the rest of them and to their management. The industry I work in there's fairly low power distance and air traffic controllers are quite a dominant cultural group and it's not such a big problem for them to speak up at all. The problem is not speaking up but more about getting something done about it**.

Respondent #12: **The culture that you create is important. Listening is not easy and is very important. Staff and supervisors have to understand the power of listening. As far**

as being able to have a voice, having near-miss, observation, taking part in risk assessments and other programs that they can get engaged in are important and they feel valued. So when an employee speaks up, are they valued and are we reacting to what they are saying? Really, it is getting leadership understanding that when an employee walks in their office impromptu, that it is important they stop what they are doing and listen to what they have to say.

Respondent #13: **One of the things that came out of a safety summit held last year was that the leadership in the plant had to communicate to every single person and make it clear that they should not operate unsafe equipment and if they have a problem with their equipment they need to get someone to help them out and they are to shut it down and not to struggle with it. We also have the employee engagement program where they can participate in the safety observation program, be involved in audits, and can identify hazards, in addition to identifying and reporting unsafe equipment. It is a very good program that has been modified recently. I believe this has helped. We still have a few that won't believe it, but at least every month it is communicated consistently from the line leadership not to operate and report unsafe equipment so that it can be repaired. We have intentionally put a lot of effort into that process to prove that if you report it, we will repair it. There is absolutely no second-guessing on shutting down equipment that is unsafe to operate regardless of production demands. The supervisors are doing a good job managing this**.

5. What tools and processes do you provide to ensure your employees' success when they go out to perform their tasks?

Respondent #1: **To ensure employee success, job planning is still valuable: things like pre-task planning, job hazard analysis, etc. The important part of this is not the outcome of that process - that is the least important part. The part that is most important is the planning, the discussion, the meeting of the minds, projecting out how the work is going to go, the contingency planning, making sure we have the right tools, what else will we need. The planning process is so crucial. In safety, we tend to focus on the planning process. We have to know that all plans are imperfect. So we have to have a learning aspect, a debriefing, after action reviews, Gemba Walks in conjunction with learning teams on the back end to learn what we had to do to get the work done, to see how close we were. How can we feed that into future planning? How can we learn from what happen to build expertise into our individuals and teams? It is not any one task, we are constantly learning about what it takes to be successful. And improving our ability to be successful. It is a combination of planning with the learning**.

Respondent #2: **Lots of things we can talk about, this assumes that the employee is the problem. What we really try to do is help the employees help us identify where the problems are. It is a matter if you make it easy for employees to tell you where the struggle is and then allow them to help solve the struggle. I don't really tell workers what to do, I help them tell me what they need. It allows them the ability to identify problems. We typically do the problem identification as managers and then tell the employees what the**

problem is and we generally get it wrong. Department of Energy has a good manual called Tools. We try and give workers the tools before they are needed. Confidence and capacity is what you manage. Confidence to belief they have input and the capacity to go out and do work in highly variable systems.

Respondent #3: **So we try not to give them too much stuff. We raked through our safety management system and remove redundancy and we would have in there what the regulator required and what we thought was essential and then threw the rest away. Next we would ask people what they wanted in addition to this very bare-bones safety management system. We try not to give and mandate too much stuff. We like for them to come with their ideas themselves. We have tools around planned versus actual assessments, we have tools around collective insight which is a form of appreciative inquiry. We have tools around incident investigations, so we teach people how to investigate success. What are the things you look for in success and it's not the same as investigating an accident, where you're simply replacing the top event as an incident with success. You're looking for setting this up as a test, leading into what didn't work, what broke? So there are all of those things that we give individuals to work with moving forward, but try to minimize the amount tools we specify and stipulate from on high. What we do give them is a clear sense of empowerment. Because they understand the process better than anyone else and their approach has been to take that ingenuity and a little bit of opportunity to open up so that we have absolute concurrency for when they go to work**.

Respondent #4: **Two parts: for myself it is an important thing is to create an environment where my employees can be successful, and success in not just in completing a task. Everything involves learning something and how much they learn in completing a task. For every task, something must be learned. Secondly, we are enjoining the organization in a series of conversations called safety engagement sessions to bring voice to people so they can bring their issues up that are affecting them to their peers and leadership. We are talking about safety in a very different way**.

Respondent #5: **There are multiple things that we do. A "Management Stand" is the first thing created at an organization. This is a living document that details the expected behaviors and actions of the organization, including the management team. It is a critical first step! Use it to communicate to the employees your expectations and the consequences of not complying or adhering. You are also doing this for the management team. It is an opportunity to find organizational weaknesses. Let them know what are the expectations and consequences. For example, you are expected and accountable to report every incident, and for not reporting there are the following listed consequences. Human Performance is my area of expertise. We must understand how humans will have errors and how that requires management systems that will intervene between errors and incidents that will intervene at the sharp end. You can't stop human error, but if it is occurring and there is a critical outcome, I will put in place avenues to ensure success. You are setting the employees up for success, but they have to understand what makes them successful**.

Respondent #6: **So I don't know if there are any tools and processes that can ensure success that we have, but we have some tools and processes that we hope can help them make decisions through that process. One of the primary ones that is used right now is risk assessment and what they will do is try and anticipate what actions will be taking place on each incident or each job task. So if it a fire, the incident management team will come in and will anticipate things like steep terrain and use a Red/Amber/Green assessment, the traditional risk-based assessment for that piece. They will try to anticipate what things they see going on, even where people will start to get sick from because they've been breathing in smoke for the last ten days and then spreading germs around the camp. This is one tool that helps, but doesn't ensure it, because it is such a dynamic changing environment out there each time. It's taken minute by minute and moment by moment essentially for them. On the best of the agency, we have this piece we call tailgate safety sessions. That is a tool that people can come together before they start their project for the day and they sit on the back of the tailgate of that truck and talk about the operation for that day and what weather is anticipated. For example, if there is rain forecast, there may be a rise in the stream levels. If there was rain the day before, they stream may already be higher. They will talk about things like their PPE, accountability, and buddy system. Also things like when they're going to come back together, when is lunch, etc. They will talk through their operations for the day and every person has a voice to talk about what going on, speak up and make sure they understand the operation's points. Maybe they do, maybe they don't. We do get a lot of temporary employees and that's the kind of variable that really bites the agency because they're the newest and freshest and don't have the experience to understand and they don't know what they don't know. The other tool that is often used is**

the traditional fallback to CFR 1910/1926. But our agency doesn't know that too well and it's not one that is heavily followed. We do have OSHA visiting us on a weekly basis throughout the organization. It's a normal thing to see OSHA with us because of our accident rates and it is high risk work in general. We do have a safety and health handbook, but it's more about each crew and talking through it at those tailgate safety sessions.

Respondent #7: **We work toward a checklist especially for high-risk environments. Most of our client's processes are fairly complex. We tried quick reference cards but did not establish accountability, and is someone neglected to use the card, steps were skipped, etc. So the checklist is filled out, signed and turned in. Additionally, our clients will modularize the equipment wherever they can. So for specific work processes, they will establish kits for the different types of repairs they perform that includes all of the tools they need. So between that and the checklist, they are set up for success. They are given all of these resources in addition to training**.

Respondent #8: **In the hospital setting, the tools are very traditional. There are procedures for everything: there is reasonable work design, patient handling equipment, constant inspections, and incident investigations. However, a lot of these traditional tools lack a focus on organizational factors. It doesn't look at the social system, social organization and the impact on work. What I find in applying Safety-II and New View and have been doing is the application of system thinking to safety. I spend a lot of time on managing system processes and serve on the chair for ANSI Z10. What I really focus on is**

systems thinking and figuring out what tools in workplace health and safety that will help organizations and people at all different levels to take a more systemic approach. I have developed and have figured out how to apply traditional system thinking tools and methods to workplace safety for safety folks and various levels of management and union reps. I haven't applied this to people who are actually doing the job. My work has been with people who are part-time on safety but are also doing other roles. But again learning teams are a way that you can systemically and hopefully institutionalize better engagement. We have to remember that these are assumption and mental models of leaders and influential people in the organization that are going to drive all of this. So critical to this is to work on their mental models and help them on their journey to change them and the way they look at these things and to choose different methods.

Respondent #9: **First and foremost the workforce needs to be trained and qualified. Technical expertise is fundamental to safe operations. If the frontline workforce clearly understands the technology and what they are doing and what the procedures are having them do, they will also be ready to respond to situations that are not covered by the procedures. Also, help them manage the risk and what the critical steps are and how to use human performance tools to address critical steps. Crew resource management (CRM) used in aviation is an example of using human performance tools and techniques. These are tools that frontline workers can use to enhance their understanding of what's going on. A book by Rhona Flin entitled *Safety at the Sharp End,* is an excellent read about human performance tools and she uses CRM quite a bit**.

Respondent #10: **Empowerment – we have given the employees the empowerment to do what needs to be done, within certain constraints. They are always good about asking if the idea is feasible and if there are any problems with it, but they are empowered to make those decisions for themselves. I was talking with our QA director and he asked what the secret to this is? My answer was that if you take care of the little problems when you find them, they won't turn into big problems. If you let it go, it will turn into a big problem. We failed to recognize this in the past and as a result we ended up with big problems that could have been resolved if caught early on**.

Respondent #11: **Not much difference from question four. They have all of the equipment, procedures, competency, and training that they need**.

Respondent #12: **Make sure that they are trained and educated on the process and try to find out what their interests are. Making sure they have all the tools they need. For example, making sure they have the right lift system and the correct gloves for the job we're asking them to do. I'm a believer in an optimized performance approach where we have ten tools that we teach. That starts with a questioning attitude, checklists, self and peer check and others. These are things that we can do day to day and make sure they are accepted. Some of this is called "mental PPE" by constantly educating them on what safety really is**.

Respondent #13: **Our training process – we do a lot of training, documentation, and use of checklists. We could do a little better on our observations during the training**

process. We have gone through in the past year and done ergonomic assessments in every department on every task. We have trained every single employee on the safest way for them to do their jobs. We have trained the technicians and supervisors as well so that they can properly observe, coach, and correct when needed. We just went through and did a complete PPE upgrade process and included everyone in the plant on an evaluation of the gloves we require them to use. There are safety meetings where they can come in and talk about issues they are having. There is our safety observation reporting system. We involve them in the incident investigations. There is still a lot more to be done in the safety front especially in teaching the employees about human organizational performance and additional safety training. The daily shift huddles by the supervisors are very helpful in communicating to the workforce and the employee's helping the shift supervisor with audits. The management of change process has been expanded so that if an equipment change is identified in another facility, it has to be approved, acknowledged and discussed in all of the other facilities that use that equipment. This prevents changes and improvements identified in other facilities from being ignored or disregarded. I think the employee on the floor has a voice as well with how they run their job as long as it conforms to the exacting processes we manufacture our product under and we involve them heavily in changes before they are implemented.

6. How do you measure and attempt to close the gap between work-as-imagined and work-as-done?

   Respondent #1: **The measurement piece means different things to different people. How can I measure means how can I quantify it? Anything like deviations or numbers of**

violations are not a useful tools in terms of detecting to identify problems and anomalies. The gap of work-as-imagined/work-as-done and to close is getting out and observing work and the accident investigations, understanding it from work-as-done instead of the failure. Closing the gap from a Safety-II mindset, it is not about the procedure but enabling the work to happen in the future. Work-as-imagined/work-as-done have the same goal, how do we enable people to meet the goal? How can we enable and facilitate that. The idea of forward-looking accountability. How can we enable the outcomes we want in the future? Work-as-imagined is a mental state that needs to come closer to work-as-done in order to be more effective at planning in the future. Work-as-imagine is what we know about the work so far.

Respondent #2: **They gap between work-as-imagined/work-as-done is normal. It always exists. I'm not sure you want to measure it because it is really variable or close it because workers need to be adaptive. One thing you will learn is that workers always complete the design. They complete the instruction, procedure and the rule. The gap I'm concerned about is between work-as-imagined and the hazards that are exposed. We are all looking for ways to look at the Tayloristic method which is sexy on the surface, but not practical in reality: write and follow a procedure. I'm not sure that it is anything other than normal. It does become important when you look at work-as-designed and the hazards associated with it. It doesn't matter what was planned, it matters what does happen. That changes how you do audits and investigations. When you audit and investigate to work-as-imagined, toward the counterfactual: worker failed to, manager failed to, then you are auditing to a fantasy. You are auditing what you wished you had**

instead of what you actually have. You need to go out and talk to your employees and understand how work is done and gives dignity to the work being done and the manager generally comes back wondering why the worker doesn't get hurt more. The gap between safety as a discrete outcome is going away. Safety and operations are not separate. Hollnagel covers this in discussing Efficiency-Thoroughness-Trade-Off. What workers are doing is constantly trading off one for the other.

Respondent #3: **There are a number of things we have when we do this and we separate our tasks into two baskets: we have high risk activities and when we go to work on high risk activities there is a number of things associated with these tasks. We do a checklist that ensures certain tasks are complete before we go to work. Ideally, tasks have been planned properly in advance. There are non-negotiable elements, go and no-go situations that we generate for these certain circumstances. What we have done in areas with compliance is to detail it be complete and I think now we are able to see the areas with all of these unnecessary assessments and where we've created unnecessary paperwork around low-level risk and instead tell them that these high-risk activities are the things we want you to focus on. While we accept that is the planned work and the way you ultimately have to do it. We want you to stop in a high risk situations and do not want to you continue and it is not a matter of you deciding whether you think it is safe or not. There are a number of no-go conditions that if they apply, you will stop. In lower-order tasks, we allow a lot more latitude for the gap between work-as-planned/work-as-done and we capture those gaps at the end of every single day. Now we're also working on a tool that allows us in real-time measure that gap across all of our projects and we're looking at dimensions such**

as resources, control, and autonomy. How much control did you have over the task, did you have the resources you needed to do the task, and did you have the autonomy necessary to complete the task successfully? You are looking at the possibility of a three dimensional grid where projects in real-time introduced their assessment of that task and other projects can then access it. So if you're doing work such as working at height with structural steel, projects can look at the database in real-time and see that when we did this elsewhere, the gap doesn't seem to be as big. What was it that they did on this other project to control that risk and minimize that gap a little bit better? So we're working on a real-time resilience model for lower-order tasks. More often than not it's not the gap between work-as-imagined/work-as-done that gets closed, it is our systems that end up getting modified more than our people. Their approach is very much how do we support our people to be successful. We found a way of doing this because if it makes sense to them then our systems should reflect that rather than individual behavior reflecting the system. This requires a strong engagement between the workforce and management to make sure these things are identified.

Respondent #4: **I like this question because it has a bunch of imbedded assumptions. One of the questions is do you want to close the gap? The difference for me is not closing the gap, as understanding the gap between work-as-imagined /work-as-done. The gap is good, the gap represents process improvement. The next thing is understanding why the gap is important. The way we have constructed reality (work as done) is the premise that we can independently design work. We need to design work in conjunction with the worker. The difference is innovation**.

Respondent #5: **This is actually very easy, just start investigating successes. Will still find the organizational weaknesses and can get a much better understanding of what the employees are up against. With a colleague, we came up with 3W Process, which means: Work, Worker, Workplace. It was established as ways to categorize hazards, risk and error-likely situations. Helps to understand what situations people are in. The Work and Worker aspects are pretty simple. The Workplace piece takes care of the physical and cultural workplace. It is included as part of the "Take 5" (mentioned in #4) assessment so they could decide if they needed to escalate something to a higher level. As an integral part of the incident investigation processes, one can begin looking at these in terms of organizational weaknesses. Constantly showing data that shows what the gaps are between work-as-imagined/work-as-done. Management will assume everything is ok unless we provide data that tells them otherwise. Unless you bring forth the breakdown, they will not change. This gives them the data they need to help bring about real-world change. Once we start showing these data points, it gives management the data to effect change. Utilize engagement tools, most organization will start with physical observations, but this does not engage the workplace. We called them safety walk and talk. Managers must go out and engage the employee, ask them what makes their work unsafe and understand what their barriers to success are. They go out to the field and look at all the breakdowns that are occurring. This is not just safety, anything (pay, benefits, etc.) that constitute a concern for the employee are fair game. Once it is identified, then that manager needs to get on the phone and correct the problem. You help make things better for the employee and you can't make this better by just focusing on safety.**

Respondent #6: **Within our fire organization they have what is called the pace model. They have containment lines, or fire strategies in place that they plan on doing. They anticipate through fire behavior analysis, what the boots on the ground are saying, that fire will do a certain thing combined with the weather. Based on this, they understand roughly what they think the fire will do. But because this is such a dynamic environment that changes minute by minute is why they build this model. They will have a line and if the fire goes through that line, we implement another set of strategies. It goes to four stages and if it hits that last stage, then they know that things have not gone as imagined at all. Work will not be done anywhere near where it was anticipated and a totally different set of strategies and tactics will be needed beyond that. If it gets to that last stage which is very rare, one way they can measure it is with this pace model. The primary plan is what they are always seeking to do. Some fires, they are successful with this and some they are not. Oftentimes, it is driven by available resources, especially manpower and in that case they will just have to monitor a fire and let it burn where it is. If it gets to a certain point, they will literally have to beg, borrow, or steal resources because there may be valuable things at risk – houses, recreational facilities, trails, etc. that will up the ante of this incident. In that case the work-as-imagined is that it the fire will do a slow burn to an area and will die off. In that case, it worked that way. In a particular case, it did not go as imagined. It was started by fireworks and because of the weather and it was in a wilderness area, it was making a mile and a half run per day and jumps a mile wide river into an adjoining state. To close the gap, they had to do different things. It became a national priority. Our agency has a way that they measure it based on priorities, values of risk and resources available.**

At the lower levels, we have been trying to build margin into our employee's day and only plan 80%, because 20% of it will be things they don't expect. This education of margin is an important component for them to understand. This has slowly been implemented and this is a work in progress trying to get them to understand this requirement.

Respondent #7: **The variety of work is so different. From most environments, the work-as-imagined/work-as-done is not that different in my opinion. If you have good competent people who are writing the procedures and the work is fairly repetitive, they are generally pretty good. When you are looking at work-as-imagined/work-as-done, it is with work such as major construction, which I don't have a lot of background in that area. However, in my previous role there was a disconnect between guidelines/procedures and practices when in the field. And Erik Hollnagel talks about closing the gap is an approximation. A lot of time that gap is created by equipment, lack of equipment or incorrect equipment. So a lot of time where you are trying to close the gap you are performing a contingency and they are just trying to get the work done and be efficient. Part of this is to make sure the materials, tools, knowledge and resources are there and available to do the work.**

Respondent #8: **I have several techniques that I use. One is to hand leaders and workers 3X5 cards and ask the leaders what they think the big health and safety problems are, what are the most dangerous jobs, those high risk tasks leading to the most severe injuries and illnesses. Then write down the top three to five jobs that fit this category on the cards. Then have the workers do the same thing. Put them all up on the wall and you**

will see this gigantic gap between the two and then say to the leaders: "What's wrong with this picture?" Also, when you have learning teams or workers providing information to managers that helps them see the contrast and the gap. Measuring this gap would be incredibly important, and if we could figure that out, it would be a huge contribution. I will use audience response devices when I do training and I ask people at different levels of the organization how great is this gap. I will use a Likert scale and usually the responses indicate it is fairly significant, particularly from the workers. In healthcare I will ask them if they think that higher leadership understands how your job is done, work-as-performed and they will show a gigantic gap. I have repeated this process in seminars with corporate safety directors representing many different employment and service sectors. It's really useful and they do recognize there is a gap. Then I will do small group activities and ask how do we close the gap? By doing this, you get them to acknowledge that there is a gap and is generally always the case. Usually, the leaders don't think there is much of a gap and the workers think there is a gigantic gap. Then to have them sit and think about how they close it. It would be a very useful tool if could know how to measure it. The gap I am talking about is not just the gap between work-as-imagined/work-as-performed. I think the important gap is between the understanding of health and safety of the leaders and the understanding of health and safety of the workers. I think that is a huge gap because that in a way is saying: what's the gap between the understanding of the blue line (work-as-performed), the reality of work in this organization, between the workers at the sharp end of the stick and the management at the blunt end. The gap between the blue line and black line (work-as-imagined) is important, it is also so situational that there is probably no way to really measure it, but this gap in understanding health and safety between the leaders

and the workers is incredibly important and that is what I would focus on first. Usually in the learning teams, one of the leaders will eventually say – I had no idea that was going on in terms of policy and equipment and then it helps them realize what they don't know and a good manager will realize this is what they need to hear.

Respondent #9: **I haven't put much emphasis on measuring that gap, but it is important for me to understand that it is rare (if ever) that work-as-done is exactly the same as work-as-imagined. This is a key principle that they need to comprehend, adopt and accept. I counsel them on this principle, going back to the concepts of reporting, observation, and feedback. First of all, they need to recognize that the gap is there. Then closing the gap is what I refer to as systems learning. You take that information and look into your system and organizational factors, the management systems, processes, etc. at an organizational level. Understand why there is a gap there and make appropriate corrections to your system**.

Respondent #10: **We really struggle with measurement of the gap, but we know it is there. And we talk about the gap between the black line (work-as-imagined) and blue line (work-as-done). We don't have a measure. What we struggle with in our company is a very complex, socio-technical organization, but very deeply rooted in tribal knowledge. A lot of our employees have been there for the entire existence of this facility and they know what's going on. That is the really the blue line. This knowledge is not written down. So finding that blue line and gaining the employees' confidence that you are there to help, not hurt. It's up to them to empower the employees to tell me what I need to do fix this. I'm going to**

write it down. In my case, when we do write procedures for the safety side, I'm always out there with the employees, giving them a copy and asking them to please read it over and tell me what I need to change. Because this is your document and I'm trying to capture and solidify the thirty to fifty years of tribal knowledge to know what we need to do to succeed. Our Gemba walks have changed over the last two years and they are very strong now. We get together on Tuesdays at 1:00 PM and go for our Gemba walks. We will stop in a department and it never fails – our questions quickly become null and void because the employee will immediately take over the conversation and start showcasing what they have done: "Here's what we have done to improve process and safety. We noticed a bottleneck in this area and this is what we have done to alleviate it." Their flow, processes, procedures, and efficiency are being showcased rather than us having to try and pull it out of them. They are very up front and willing to say something when they weren't years ago. When they would see us coming before, it was viewed that we were there to hurt, not help. I am extremely proud of everybody's support. It's not just safety, it is quality and everyone else's support. I like to think we had something to do with this. It is really amazing the things they come up with. Before it was just a gripe session. In fairness, perhaps the person did try to help and was shot down due to monetary constraints and the employee on the floor doesn't understand that. Now, they are providing these improvements on their own for themselves, and it is really great to see what they are doing to showcase their story.

Respondent #11: **Measure not so much, although via questionnaires we can look at the differences in responses between managers and staff. So this is interesting as questionnaires get quite a hard time but we've spent years on psychometrics and we're able**

to measure what managers think about staffing, training, and procedures and what staff think about them. Without exception, it's always far more favorable from the eyes of managers than staff. That doesn't mean one is always right and the other wrong, but by using questionnaires you're able to quantify some of the aspects of that gap. Which you're not able to quantify in other ways. Managers typically do want some quantification of something. So that is really the main means in terms of measurement that we would do. But in workshops, you get more understanding from the perspectives of one versus the other. Managers and staff don't spend a lot of time talking to each other. So it can be useful for managers to hear independently via researchers the perspectives of staff. They're not just necessarily complaints or whines. There's actually some valid concerns there.

Respondent #12: **I see an example of this doing risk assessments, specifically Job Safety Analysis. If you have an operator step you through what they do I find is they are just as surprised as I am about the details of what they are doing. They take it for granted – sort of like driving a vehicle, most of the time we just do it without thinking a lot about it. When you start breaking it down, all of a sudden they realize "I really do it this way?" I struggled with this question when first I read it but what I discerned was that operators go out there and do their job every day. And then we safety, process engineering, or others go out and say "you have to quit doing it this way, you need to do it this different way because it is a quality or safety issue." That's because we learn how they do it as opposed to how they imagine they do it. I think when you go through a step by step risk assessment on a line with an operator, and many times I use two or three operators when I do these and all of us start looking at all of the details about where they place their hands and all of a**

sudden they say "I see what you mean!" I recall a really bad hand injury we had a couple of years ago and it was due to putting their hand in an unsafe location, purely out of habit. I think measuring and closing the gap is just stepping it through step by step of how you perform a specific task and talk through how you do it.

Respondent #13: **I think there is a gap and you want to try and close it. Someone comes into a job and in their training process, you need to do is make sure they are all being trained the same way, especially if there are multiple trainers. One thing we did when we were doing all of the ergonomics training is that we brought all of the trainers in and trained them the same way to reduce the variability. That is a gap that we identified and that is one way we attempt to close that gap. We also continued that with them on their other training responsibilities and jobs. So we are putting forth a lot of effort to make sure everyone is trained the same way. The other thing we did was train the shift supervisors so that they have a full understanding of how the employee's jobs should be performed. So when they are out there doing their audits, they can monitor and make sure it is being done properly. Also we keep communicating how we want the job performed. We want to make sure there are no shortcuts and that is one thing that will lead you to do a job differently than you were trained. Production pressure will put people in that situation where they feel they can get more done if I take a shortcut and improve my output times. So we have done a lot of work around that to tell them to do it the way we ask and show them how a shortcut will result in an inferior product. That is one of the shift supervisor's responsibility to make sure the employees are doing the job the way they were trained and understanding if it is not and why. The job safety analysis (JSA) will ultimately get at that**

as well. Taking the standard operating procedure with you while the JSA is being done and documenting the way it is done is another way at addressing that gap. Following that up with retraining based on the results of the JSA is another way. Now there are a lot of good veteran employees out there that know this equipment very well and developed good skills and we attempt to utilize those people and put them in a position where those skills can be shared. However, our process requires an exacting standard and the expectation is that they follow the instructions and anything different must be analyzed carefully for product quality reasons and to make sure our customer gets what they ordered. We encourage people to tell us if there is something about the process that makes it difficult and we try to do what we can to accommodate them and ease that difficulty.

7. What tools do you use to implement Safety-II and how do you perform risk analysis? Additionally, do you use or have you considered using Functional Resonance Analysis Method (FRAM), Resilience Assessment Grid (RAG), or Appreciative Analysis query as part of your risk assessment tools?

Respondent #1: **In terms of risk analysis, it depends on the job. Some are required by law – confined space entry for example. From a Safety-II perspective, I try to use many of the tools that are in human factors engineering to understand how work is happening and what it would take to enable that work to happen like cognitive work analysis. For FRAM, I use it but don't use the visual modeling. I go out and talk to the workers and ask questions about what it takes to get work done and put those instantiation projecting into the future as to how that system can vary over time based on what we know about**

variations. We mentally project that or will use a group sometimes to see that comes out. For resilience assessment grid, not something I've used yet, have started working with a client to develop ways to measure at a strategic level their transition to more of a resilience engineering /Safety-II approach. For appreciative analysis, I haven't use it specifically but there is a process called ALFA that I have not gone through all of the steps, but the concepts of appreciative investigation, appreciative analysis, appreciative learning is definitely something that I have used a lot. I have had many discussion about how work has happened coming up with stories where work becomes difficult and coming up with opportunities for system improvements.

Respondent #2: **Risk analysis is not how we perform, but can we perform and why we perform. We do it to manage resource around the risk, not the risk itself. The assumption this makes is that risk is somewhat permanent. Risk is incredibly fluid, it ebbs and flows. What is done today may not be valid tomorrow. The better question is how risk competent are the people who perform the risk. We need to do risk analysis, because it is important to remove risk, but the problem is we can't remove all risk or identify all risk. We tend to use the word hazard and risk sort of synonymously and the hazard is the thing that can hurt a person and risk is the person's association to that hazard. One thing I'm fixated on is not managing risk by probability but by certainty. So instead of asking what's risky, what is least recoverable? If it is a high risk operation and it's easily recoverable, it's not that risky. Because I can always recover and have a second chance. When I want to manage the risky operation that's not easily recoverable, then I want to manage that not by risk, because we are good at prevention buy stink at prediction. So I don't do risk analysis**

based on a percentage, I just assume there is 100% it will happen - so I then back away and say when it happens, what is our resilience, how do we recover? On Risk Analysis tools: Yes, I have been using the appreciate suite for years and years because I am a social scientist. I work with engineers, scientist and technical people, and they really like it. As far as FRAM, I have a co-worker, incredible Safety-II guy, he used FRAM but it is difficult and complex and it is like learning a language. It is very detailed driven and not fast and not very efficient but is pretty thorough, but still pretty strongly biased. Safety-II and Resilience Engineering - David Woods is interesting to me but he is between FRAM and my soft side. We are trying to understand the context of having an event. Not that we keep people safe, but intervene against failure as a logical outcome because of entropy and stop failure from happening. Systems are generally stable and people are good at reacting. Everyone is still trying to crack the code on understanding events.

Respondent #3: **So we used FRAM a little bit, and we've touched upon doing a little bit of Hollnagel's resilience work in terms of Monitor/Respond/Learn/Anticipate, and because we are very much a people centric organization, and that permeates our business beyond safety. We're privately owned and looked upon as a big family, so then the approach will always favor things like appreciative analysis. Because it involves people a lot more. If you look at Hollnagel's approach to Safety-II and Dekker's approach, we favor Dekker's approach because it is much more humanistic and people-centric where as Hollnagel is a little bit engineering centric for us. And FRAM is unfortunately a little bit resource intensive, and a lot of our people don't really understand the outputs from it. If it involves people sitting down and discussing how we are going to successfully complete this**

task as opposed to a computerized model, we will favor the former because that actually feeds into how we measure success. Our tradespeople relate better to people centric models.

Respondent #4: **Linear risk analysis is based on probability and severity and data to support. You must be able to look at a data set rich enough to provide statistical reference. In most operations we don't capture the data sufficiently to understand what the probability of an event is. And it is a subjective process. Anything you do must take into account the culture of the organization. I prefer John Adams thinking on risk. We tried FRAM but was a complete failure, did not use Resilience Assessment Grid, and Appreciative Analysis Inquiry introduces a certain bias into the process. We're using John Adams book entitled Risk, and risk behavior is on 4 major points: First- What is the sense of reward (high or low), if it is high you will be drawn to the higher level of risk. If is a low then you are drawn to probability and severity (2nd and 3rd points). What grounds people is the probability and severity. Humans naturally normalize risk (driving a car for example, once we learn how we simply look at it as a means of conveyance). Unless there is something that changes that risk, it is normalized. The fourth is the individual's propensity to take risk. The people we hire are risk takers. What is the sense of reward? If the sense of reward is remarkably high then consequently, the risk level goes up. We have a discussion and ask: what are the conditions that are influences? What do you/do not have control of, what is taking decisiveness in to areas where are you more vulnerable? The vulnerability is equivalent to risk and that vulnerability is a sense of uncertainty that FRAM never touches. FRAM works great if your system is controllable, but once you go out of a controlled environment it doesn't work well. We tried using it retrospectively like**

Hollnagel suggested but didn't take into account the network of influences that we face. Rasmussen axiom map takes us a lot further than FRAM. We use a complexity based understanding of the system. We have gone beyond engineering. There are things that transpire what goes beyond our ability to predict. We have to learn in the moment and develop innovation and be able to not only anticipate but recognize anomalies and heighten the ability that the system is delivering the unexpected and we have no process or routine. Actually, routine can make us more vulnerable.

Respondent #5: **I am not a fan of risk analysis, because the majority of them are done non-effectively. Most are ineffective because they are not dealing with what will make that person successful. Every person at an organization needs to be a risk manager, and needs to have the ability to be able to perform the analysis based on their level of knowledge. If you have find risks, hazards in any one of the 3W (Work, Worker, Workplace) process described in question #6), it is ok to move forward. If they are found in any two categories, you need to stop and escalate! Because the probability of an incident has just gone up dramatically. It is critical that the employees need to have that level of authority. Employees need to have the ability to use and employ these techniques effectively. If risk analysis to be done well, it has to be at the worker level. Usually, they are done, put on a shelf and not used. Unless they are utilized, they are of no value**.

Respondent #6: **We don't use FRAM, RAG or Appreciative Analysis. It's not something the agency is familiar with. The closest we come is using the Red/Amber/Green grid. It is interesting in that the agency does not follow a standard format with the**

Red/Amber/Green. Every team has their own format that they use. We have been trying to simplify and train people on it and it hasn't been working very well. Each region in the agency has been implementing their own form of risk analysis. The most productive example is that one of our regions has the Job Hazard Analysis (JHA) and is heavily used throughout the agency. JHA's are the norm in our agency but they have become very much a pencil and paper type activity where people do it just to check the box and say it's done. We've put the Red/Amber/Green piece into that form so that they have to take more time to go through and put some thought process it. And some found they were actually doing a lot of work in the Red and not doing anything to mitigate that down to be proactive. As a result, they've started to do that more frequently, but the education piece is still the biggest piece in that process because of the turnover with our temporary workforce and our permanent people move a lot. That has been our big hindrance in implementing some of these risk analysis processes in the agency and it's definitely one of our biggest risk factors. Some of these risk analysis processes are resource intensive and this agency is overwhelmed in the amount of work they want to get done and so they ignore a lot of the things that could be doing to save them time, effort, lives, help people go home whole each day because of being overwhelmed. I don't feel this tool is adequate, but it is at least starting conversations in some workgroups, but not all because not all are doing it. There is no way to mandate people to do it because we are spread out and decentralized.

Respondent #7: **Risk analysis is performed very traditionally, for example the 3x3, 4x4, 5x5 grids. We have considered using FRAM for pre-work and incident investigations, but due to lack of FRAM resources other than FRAM website and it takes a bunch of work**

and time to put it together and in a small organization, we don't have the resources. It's one of several projects I've currently got going. Resilience Assessment Grid – yes, Appreciative Analysis query, yes somewhat. It's somewhere between that and the cooperative analysis method.

Respondent #8: **I have some familiarity with those tools but never used any of them. I've interviewed people and talked to them about the tools and looked at a bunch of case examples. The tools that I've taught at workshops and some organizations are using is things like Rasmussen's organization model and Nancy Leveson at MIT has a knockoff version which is a little bit better and uses a system model entitled "A System Approach to Risk Management Through Leading Indicators." This model stated that "injuries and illnesses are not caused by an individual component of person, those are symptoms. But rather the interaction of system components." I have the organization focus on the operating assumptions and local management needs on what to be doing to be successful. But they also need to be focused on that the corporation is doing, what the facility and product process as a whole are doing. This helps people think more systemically and ask what it is going to take for successful work at all levels of the organization. This help outlines the control structure. When we investigate incidents we start with what is our control structure and what was going on at the time of incident. The latest system thinking model I've been working on is an iceberg model where only a small portion of underlying causes of events and patterns are apparent and what are the systemic structures that have been in effect allowing these incidents and accidents or unsuccessful work to occur. I have found that people like tools like these and they are relatively easy to use. They think about**

the events- what are the patterns and structures? And in doing that, what are the assumptions that you work on to uncover the procedure is wrong. They can also use these tools with minimal training and they improve quickly the more it is used. In a typical incident investigation all that we're going to see is the event and some evaluation and we not going to carefully think about the systemic structure and we're never going to ask ourselves what is it about our thinking that's preventing us from improving in these areas. We have to have practical tools that people can use and will not overwhelm them.

Respondent #9: **Part of my consulting offering is what I call critical step mapping. The approach I promote with managers is understanding the risk. An event is defined as harm, injury, loss, or damage to assets. That is usually due to a loss of control, a transfer of energy, a movement of mass, or a transmission of information in a way that causes harm. There are three things: you have assets that are built in to add value; to do work you have to have hazards; and the human is interacting with assets and interacting with hazards in order to create value. That interaction also creates risk and that risk is at the interfaces. If you study resilience engineering, they talk about the system interfaces. From a managers' standpoint, these are pathways and touchpoints. If you put an asset in close proximity with a hazard and you only have one equipment action to transfer energy, then you have a pathway to harm. Equate this to crossing a busy street and you are entering a line of fire. You are at a critical step, you are in the pathway because you do not have control of the moving vehicles. Anytime in an operation, you want to help people recognize pathways between hazards and assets. An asset might be yourself from a personal safety standpoint. Secondly, where are the touchpoints (critical steps) in an operation where you have created**

a pathway and now if you make a mistake at that pathway, you are going to cause serious harm? I put together a process for analyzing this in a tabletop exercise to identify all of those critical steps or points in an operation and looking backwards to find out what are the risk important steps or actions that have to occur to create safety at critical steps. Equate this to parachuting out of an aircraft. The critical step is jumping out of the aircraft. That is the point of no return. But before you do that step you have to make sure the parachute has been packed and folded correctly. You have to make sure it is donned correctly and you know how to deploy it. These are conditions that have to exist before you step out of the aircraft. This is what critical step mapping is all about. For Hollnagel's resilience actions of respond, monitor, learn, and anticipate, he looks as these as 'potentials'. I look at them as a way of thinking. As far as FRAM, I have been using it personally and want to use it for critical steps and feel there is application there for this. I am also looking at the Resilience Assessment Grid as a means to augmenting my own assessments. I am in the process of applying both of these but do not use Appreciative Analysis query. I see practical application of FRAM in commerce where once you identify high risk activity, you can use FRAM analysis to model these critical steps. I am equating the critical steps to the functions in the FRAM modeler, because essentially that is what they are. I can see using FRAM in critical step mapping as part of the planning phase.

Respondent #10: **Yes, we recently started using FRAM. I bought everyone in our office a copy of Erik Hollnagel's book and we've all read it. We get together on Thursdays and talk about an hour and a half about it and draw diagrams on the wall and worked our own way through it. It is difficult to understand until you get the hang of it and we are not**

masters at it, but it does start to project a process map of whatever it is you are looking at. We were going to start in one of our smaller departments, but then decided that we were starting in the middle of the puzzle and try to work to the edges. Why don't we start on the edges and frame it out. So we started with leadership level positions and model those positions and came up that we have seven layers of leadership within our facility. The FRAM model brought those systemic difficulties out we are all experiencing and we did not recognize it until then. Now we are doing department modeling and how each department interacts with each other through their processes, flows, input, outputs, and time pressures. And after that we are going to move to process modeling. So we're trying to step it back down into the department itself, but these "spiders" (FRAM Models) are just getting huge. I think that was Hollnagel's intent was to try and break it down into sections and identify where we can make improvements. This is a long-term effort but we're slowly working our way through it. We all think this is an extremely valuable process. We are excited about it and least our team is trying it. We all have our books out as we go through it to make sure the lines are drawn correctly. We have not started using Resilience Assessment Grid, but have heard of it. I love data, the more I have the better off I am. We all just need to keep working the FRAM model and do our best to perfect it.

Respondent #11: **FRAM has been used within our industry, but not with great perceived success. That may be because of the way it was used and because of the particular setup. It wasn't me doing it. Resilience Assessment Grid – not really and Appreciative Analysis query not in the way that it was formed. Appreciative Analysis completely ignores problems which is fine but is not Safety-II. It only addresses one aspect**

and that is a re-balancing act by looking at what goes well. Safety-II is about what goes, not just about what goes well- and that's a very important point. When we do workshops we're looking at everyday work, drifts in performance, standards. But we also use system thinking methods that are consistent with Safety-II. We look at using influence diagram, which is not the same as FRAM although FRAM is an influence diagram of sorts. We use native influence diagrams, unstructured or structured around like an axiomatic framework. That's how I use influence diagrams. Doesn't mean it's an axiom, but you can use the same framework. Primarily I use observation and discussion and system thinking methods for whatever's necessary for the purpose - all kinds of system thinking methods for looking at risk. In terms of risk analysis, I can't say that many people would be doing that alongside their traditional cause-effect, linear risk assessment methods. Regulation drives that activity quite a lot.

Respondent #12: **We do the typical HIRA (Hazard Identification Risk Assessment) of Severity, Probability and Frequency - the traditional risk analysis. That is our documented way of doing these and get the product of those three values to give us a risk value. We have used variations of this tool over time. It all gets back to the employee. I have been a fairly big advocate of behavioral based safety observations. That puts it in employee's hands and the tool we use is a checklist of things the employee does properly and improperly – or there may be a new task and not be a documented proper way of doing it. Feedback is given to the operator from the observation checklist. Also going back to the job hazard analysis and job safety analysis is another form to engage our employees with. Our trainers for each process are required to review and keep those updated with**

whatever process changes have occurred on an annual basis. I have read about Appreciative Analysis, but have not used it, FRAM, or RAG.

Respondent #13: **I am not familiar with any of those tools or terms. When we are using our management of change system which is checklist based and seeing what the project is going to include, part of that is the identification of the risk assessments or evaluations that they will perform. In the implementation of that project initially and once the drawings are produced we would use a failure mode and effects analysis (FMEA). If it is chemical based process, it will be a hazard and operability study (HazOp). And we perform a HazOp for all chemicals coming into the facility, not just the ones covered under the OSHA standard. These are ingrained processes here. After that we will do another risk assessment for the interaction with the equipment and ultimately the job safety analysis (JSA) for the people involvement and different tasks required. These are all well-documented in our requirements. If you are putting in a robotic system the ANSI robot risk assessment is required. We have other options based on the situation**.

8. How do you measure safety success? How has this affected injury rates in your organization?

Respondent #1: **In terms of safety success, it depends on how you define that term: safety, if you use Safety-II context it is a capacity to be successful in varying conditions.**

You can't measure safety directly, you have to measure the potential, the potential to be safe, and the potential to be resilient. That is what I look at and recommend that clients look at it in a very specific way. How is that task to be successful? How would we measure that? In terms of numbers, what are the tools, are they readily available? And if not how soon can we get them? One thing we need to get more comfortable with is Qualitative metrics in terms of what it took to get the work done. Identify and sharing the stories that come out, these are measures of safety success, we are giving ourselves the potential to be more resilient and successful in the future. In some ways that is an indicator. It is not traditional. It depends on what that the organization does, there will be different indicators. Numbers are not telling you things that are a value. What do numbers mean? Qualitative metrics, stories and task specific indicators. Subjective determinations. As it relates to injury rates, it is not a metric that gives you good data, especially in terms of Safety-II. Injury rates are not a measure of safety success. Safety is the measure of being successful in varying conditions. In terms of the clients I work with they claim that the injury rates drop but it is hard for me to claim credit for that. One thing that has a potential to be an indicator is how an organization reacts to an incident is an indicator as to how they will be safe in the future. When failure happens, how do they respond? Do they respond in a way that says we can learn how our system allowed this to happen? Now we can learn about our system and improve it. One that acts this way has a high potential to be successful in the future.

Respondent #2: **How do you define safety success? If you see safety as an outcome to be achieved then you measure it retrospectively. If you see safety as a capacity then you**

have to measure it differently. Reactive measures are powerful but are terrible metrics and not informative. If you do safety as a capacity, then you ask: what is my capacity to do work in a high risk system, in a variable system and what is my resilience and recovery? You want to look at safety on a maturity curve. You want to look at safety as a vector, measuring direction and not discrete moments. Are we getting better, are we getting worse, are we staying the same? Are we vectoring toward improvement or toward blame and punishment? That is how I look at it and recommend Techdoc 1329 from the IAEA as a great document. Talks about culture and performance as a capacity and not an outcome. There is no such thing as a leading safety metric. If there were we would be using them now. You are never finished with reliability or safety in a high risk operation.

Respondent #3: **We have three baskets of measures for the moment: The first is a traditional basket, as many of our clients still want traditional measures and we will collect that and give that to them. Actually knowing how many people at work are injured is still important. You may not consider it anything you can directly affect, but you may also be morally bankrupt if you are talking about efficiency rates and other stuff, but you don't know how many people have been injured working. We don't consider them to be particularly informative but it is still collected. The middle basket is where a lot of our stuff is coming from. They are system health metrics that tell us that the system is doing what we want it to do. We will generate a number of actions from severe close-call investigations, we call them potential class one investigations. If that could have led to altering someone's future permanently or killing someone, but for some reason a control measure worked or we were just lucky, that outcome wasn't realized. We consider them to be real gifts and**

fantastic. This is something that could have killed someone and didn't, we need to extract all possible learnings from this. We have a call every Thursday with our senior leaders across the world to discuss these events and this is all we talk about. From those discussions, a series of recommendations will go out. Some will be relatively small and tactical and others will be large and rather strategic. We as an organization have control over how long we think that's going to take to deploy the resources that will make that happen within that time. Similarly, when we have recommendations that come from an investigation or collective insights, we have control over the resources and tools we employ and the time we need to complete that actions. We can control efficiency based on that and if it is at 100% we should be closing everything within that timeframe. Now we are not at 100%, but currently 93% efficiency at the moment. We are identifying areas where we are drifting into the fragile regions of resilience. Things are breaking, but they are not breaking to the point they are hurting people, but we need to rapidly bring these back into the proper level of efficiency. The third basket is we looked at Hollnagel's risk monitor and anticipate/learn piece and there is a lot testing and comparison you can do with accidents relationally and it's singularly focused. It's not particularly accurate at the moment but I still think it's a good indicator of how our people are feeling. And yes we have seen incident rates fall but also have seen the amount of time people take off as a result of an accident also fall. We have talked to people about that (ones in Australia) and the response is well four years ago, you didn't care so I would take more time off. But now I've got mastery and autonomy over what I do, why would I not want to be here?

Respondent #4: **There are multiple measures of success. One is the realization that our field crews understand what the conditions are doing to them, how the condition are managing the situation instead of them managing the situation. As long as the system is delivering the expected it drives you into autonomic and intuitive response. When this no longer occurs, you have to move into a more deliberative and less efficient response. This is where we introduce Condiment's idea of system 1 and system 2 thinking. We get asked after an incident: why didn't they think or communicate and we answer that the crews thought it was routine. How are the dialogues emerging and what are they talking about? We still have to do all of the OSHA statistics. However, once we started thinking systemically, the injury rate has declined. It is not a function of reporting as that too has improved, but even with that, it is still less and indicates we are on the right trajectory**.

Respondent #5: **We don't measure incident rates. We have taken them away from lower level organizations that tie them to incentives and instead measure on positive actions that will lead to a more robust organization. Unless you are doing things around Safety-II, you are not going to get any better. You are going to get to a certain level and not improve. Are you using measurements to drive behaviors and actions? If so, you can't do this by measuring incident rates. This will only lead to measuring and manipulating the incident rate. Measure your actions, not the outcomes. Fifteen years ago it was relevant when the incident rates were 5.0, 10.0 and even higher, but not any longer. Measure the outcomes that will produce success. If you want to effect it better measure it in that method. Measure input instead of output**.

Respondent #6: **Measuring safety within this organization is usually done unit by unit and forest by forest. The Safety-I go to method is by the statistics. I try and compare and highlight us using Bureau of Labor Statistics data to other federal agencies. Our statistics can vary between ten and twenty per cent. So we found that they were normalizing work. Using that data effectively does help. We show our fatalities and what is going on with them. But a lot of the minor stuff is being normalized so we can't use that as part of our success. One part that has been successful is the safety journey piece with people sitting down and having open, frank conversations. In some units, it's a lot more effective than others with that trust that is being built within that organization. These conversations were not being held prior and to me that is a major success story**.

Respondent #7: **Injury rates are absolutely voodoo and mean nothing to me. In systems safety success is by risk reduction. You can't get everything in the system or no work will get done. There is always risk. Stating zero injuries is just political framing and is impossible especially in a workplace where technology is present. You quantify risk reduction as best you can by a risk priority number (probability times impact) and when you measure success, you look at improvements, and it is based on proactive endeavors to reduce risk and what the dollar cost is to do that. You have to measure overall risk ratings and cost to risk**.

Respondent #8: **I've had safety directors anecdotally tell what we have done has made a big difference, but I don't have the stats. I was working with a large government organization and we were doing a New View training with leaders and a learning team and**

they said the incident rate had dropped 20%. I'm not a big incident rate guy and I think there are all kinds of problems with that measure. I'm not saying we shouldn't use it at all, but I think it is incredibly overused and misused. I think that there are cases where if we implement New View right, the incident rate should go up because we'll increase reporting as there will not be as much stuff underground and the fact that the incident rate goes up is a good thing given that there is greater opportunity to learn. What we have happening then is not more incidents, just more reporting of incidents. That's the improvement. The larger question is how you think about reporting and Nancy Leveson wrote a paper on leading indicators and she said is that you have to think about what you think safety is and if you have a systemic view then you realize that safety is an emergent system property and you have to figure out what are the key factors of your control structure. Once you have figured that out then that is what you measure. Typically, right now we measure individual parts of the system in isolation from one another. Like incidents, investigations, contractor safety, procurement, hazards, etc. What we should be measuring is the integration. How the system pieces fit together. How does leadership fit with the workers? How does safety integrate into the operations? This what we have not done. We have made the mistake of saying that if we improve the individual parts of the system, we will get what we want. And that's a fundamental system mistake. Some organizations are now really trying to measure these things. I am finding that organizations all over are realizing that the incident rate has huge problems. I will ask at conferences again using my Likert scale: "is the OSHA incident rate an accurate reflection of safety performance?" I have done this with thousands of safety people and organizations and it has never polled positive. People know there is a huge problem with the incident rate but they are not sure what to do about it.

Respondent #9: **It has absolutely affected injury rates. One of my early clients was with a transmission distribution utility and after implementing this, they had a sustained significant reduction in injury rates from their field operations and lineman. In terms of measuring safety success, one of the challenges and according to Hollnagel, if you are using lagging indicators the traditional safety metric is a negative metric and the tendency for the direction of goodness is to go to zero. I always pose this to executives: "If your safety metric has been zero for the last two years, how do you know that you're safe?" I pose the following to the operators: "If technical specs are satisfied and all other conditions are normal, how do you know you're safe? What do you pay attention to know that you are safe?" Their response is along the lines of that we are doing pre-job briefings, we are planning work. So what you have to start measuring are leading indicators of behavior and conditions. You are looking at people's behaviors and the current conditions of your assets. Have measures or leading indicators of people's behavior towards the assets and hazards. And also what are the proper conditions and are they within constraints**.

Respondent #10: **We're using Safety-I with reporting our injury rates and it's hard to get away from that. But showing our leadership and standing at the executive boards and doing daily and weekly report outs, it is a nice result when we finalized our annual reports. In fiscal year 2011 our worker comp claims were $381,000. For fiscal year 2017, it was $18,000. Our incident rate for the same period went from 5.6 to 0.8. Also for the same period, lost workdays went from 1,481 to 16. This is the only vehicle I have found to get to the senior leadership and they like the money aspect of it. Now we have had hundreds of**

corrective hazards versus one or zero injury. **We literally had an upside down (Heinrich's) safety triangle where previously we had many, many recordable accidents and no near-misses reported. I'm proud of the numbers but recognize these reactive measures is not the message I want to send. I don't want to encourage non-reporting**.

Respondent #11: **No, it is actually way too early to look at that. We don't look at injuries for a start, we would look at incidents. But for the serious incident they are relatively low and so variable. I don't even think you could ascribe any causation to the particular model that you would use. I would far rather use discussions and interview data to qualitatively understand safety rather than measuring safety success. Because what's really being measured according to this question is un-safety success. It is looking at reactive measures which are already quite rare in our work**.

Respondent #12: **We had a communications meeting last week and I'm always the first one queued up to speak about safety. We have a lot of new people and I want to introduce myself at these meetings and tell about my background in safety. I tell them that this is all about morale, feeling good about what you are doing and that we will react if we have a safety issue. We really care about safety. I feel an energy and synergy that I'm getting really excited about how good we can be in safety. The number one thing is: do your employees have a good questioning attitude? Do they feel comfortable bringing up issues about safety? That is one way to measure safety success in how do your employees react to safety day in and day out. When they come and talk to you about safety at home is another. Now admittedly this is hard to measure but if you're not hearing or feeling about these**

things from the employees, then you're probably not very successful. There are other ways – how many near-misses are they reporting. Are they bringing up hazards – and solutions to your attention? It has to help the injury rates. If you have a system that promotes employee conversations about safety and you can measure that, it would be a good way. The other thing you can do is send phantom observers around the plant and just do statistics on things like seat belt usage. Safety-II success is about employee engagement.

Respondent #13: **Unfortunately, we still measure ours by recordable frequency. We have a new corporate safety director and maybe that will change. But we are also trying to measure it by safety involvement and we have objectives around safety involvement and the each member of the plant staff and leadership has an objective around safety involvement. They now have a responsibility for overseeing one of the primary safety objectives for the year and are measured on their success. We have our employee engagement program and has been changed where it doesn't just involve the employee but their line leadership as well. The objective this year is 90% of everyone in the facility having at least six points on this program. We have a long list of items that are part of this program and their supervisor has to input their completions. We call it our "Safety Officer Program" where everyone in the plant is considered a safety officer. Everyone has to be involved and participate to help out with safety. One of the things that has impacted injury rates is our shift supervisor involvement and leadership engagement. They have responsibilities and objectives where that on every shift they have to do a safety meeting which includes a safety talk on a specific topic and a safety audit in one of their areas of responsibilities. Some shift supervisors have started to include the employees in those**

audits, different ones of each shift and have also given them a part in presenting at the shift huddles to review incident reports, serious injury and fatality reports, and recordables from other facilities, and how they are doing on safety. The goal is keeping it as positive as they can and staying away from the negative aspects. These mandatory huddles at the beginning of the shift have also helped. The shift supervisors have to do a report on these huddles which are read by leadership who in turn give a report back on them as well as follow up on any concerns expressed they need help with and this help tends to happen fairly quickly. This helps the morale of the workforce in that they see a quick response and resolution to their concerns. The plant leadership firmly believes this is a very positive and impactful action.

9. When do you feel the need to "refresh" safety in your organization?

Respondent #1: **All the time. If I flip this statement and ask when is the time not to refresh safety and that is when an accident occurs and people want to knee-jerk and make everything worse. From a Safety-II lens, accidents are not failures of a broken component but unintended outcomes of system design, of how it was operating in that condition. Our learning and ability to adapt should be a continual activity and not a discrete one. We should be continually learning and asking people why are they doing what they doing and bringing that back into the systems and planning process. It is not a huge organization change, but a constant organic change. It is more of an exploration than a journey because we are not sure as to what is going to happen. We are constantly seeing what is out there**.

Respondent #2: **That assumes safety as an outcome, it is a capacity so you are always refreshing safety**.

Respondent #3: **This question was overlooked during the interview**.

Respondent #4: **Continuously, it never stops**.

Respondent #5: **You are selling all the time the future potential of safety. Always look at safety as an organizational issue. Must be a strong disciple in loss control. There is always such a loss in money and harm, so you are constantly selling safety as to do the right thing in terms of quality, reliability, efficiency, and improved customer satisfaction. Not just improving safety for the moral reasons (which is okay), but for all of these others things as well. I took on an organization and saved an extra $30 Million for them just by taking a loss control approach. Loss control is where the future of safety is. We just can't sell safety for safety sakes, because unfortunately people honestly really don't care. You are in business to make money and take care of your customers. If you are going after the right things for operational excellence, then you must focus on the inputs and safety is part of that and will produce the positive outcomes you want for safety**.

Respondent #6: **To me it's every day. If we keep doing the status quo, we will be getting the same outcomes over and over again. We need to be constantly innovating, constantly looking at what's going on and constantly evaluation day by day. Once we have**

that, we can start to understand what's going on within an organization. If we keep doing the same thing we're going to have complacency. It's being constantly proactive.

Respondent #7: **When nothing is going on and it's quiet. Systems require feedback, when everything goes well and there's nothing to fix – this is when you have to start pinging people through leadership site engagements and go through the hazard/job safety analysis with the crew. When things are going wrong, that feels like the safest time because you are getting a lot of feedback on your system and how things are working**.

Respondent #8: **When you do the New View and focus on successful work, it just energizes everyone. It just releases this huge energy. You start to get people volunteering and offering to work on learning teams. They are coming up with ideas and problems that they'd like to focus learning teams on. Managers are starting to look around and see all kind of opportunities for improving things because instead of working on safety, they are working on successful work. We are looking at things more holistically and I find it generates incredible energy. It releases this freedom and I can just work on stuff. So the need to refresh is less because it seems to have an energy of its own that is pretty spontaneous and organic. It is a self-sustaining continuous improvement process as long as it is sustained and supported which is usually the case as managers support it more and more which energizes it more and more. It is a different approach when we say we're all going to be about successful work and not just preventing injuries in one area or following procedures which doesn't have this organic support and is working at odds with the system. Workers and supervisors doing the job are already focused on successful work, in**

other words - how am I going to get the job done? So this is a more holistic view and it just doesn't need to be refreshed. It generates energy spontaneously. You are rewarding engagement instead of punishing people for raising stuff up and giving people an opportunity to release their collective ideas. You are taking advantage of collective knowledge and closing the gap between the sharp and blunt end.

Respondent #9: **It's normal for people to get focused on production because the metrics are positively reinforcing. During the typical production meeting, there will be a five minute safety update at the beginning and then will say now let's get down to work and production objectives. I push back on managers on this because it promotes the assumption that safety and production are separate thoughts, ideas, and planning. I promote the idea that when you talk about production, you had better be talking about safety at the same moment. If you are doing work, which equals force times distance and you have to have some kind of energy there is some built in hazard to apply that force and something's going to change. Do you have positive control of that change? When you are talking production, what are the safety ramifications of those production plans? It should be concurrent. Maybe you have stand-downs on every significant near-hit or event or a trend/drift in unsafe behaviors in high hazard activities and feel it is necessary to stop work. Overall, I think it should be ongoing**.

Respondent #10: **We do it daily. We put out what we call pre-communication messages in other words – toolbox talks. And each week is a theme. Each workday builds on the theme. Our west coast safety manager is a good artist and we have hundreds of these**

built up now that we share – they are cartoons that are very visual and build on this weekly theme message. Every Friday afternoon they go out to all the managers and supervisors and they are posted on our bulletin boards around our facility. That what we all talk about at our toolbox talks and it's the same message amongst all of us. When you are walking through the facility, you know that all the departments have the same message to relay and everyone is receiving the same message. The toolbox talks are very effective. The cartoons are funny and get your attention. They are a short message that builds on each other for the week. As a contrast there is not good communication on some of the production aspects, but safety is standing solid on this area.

Respondent #11: **That's the reason for Safety-II. We've reached a flat line in what we can achieve by our old thinking, but I think the foundations of Safety-I are how we naturally and instinctively tend to think about safety, so you always need to reevaluate it. We naturally seem to blame people when things go wrong. We naturally seem to think in an accident, they are the cause. It's an ongoing process**.

Respondent #12: **Every day, you have to live it every day. To keep it fresh you have to walk it and talk it and can't let up. We have had some of our most successful months following a stand down after a couple of bad situations. We talked seriously to the employees about going home safe, but it wasn't a session to fuss at them. We made it personalized and family oriented. But it goes back to the point that it has to be done every day**.

Respondent #13: **Every year you have to. You have to look at what you've done, where you're going, where you've been. Look at doing something differently. It could be refreshed more often than that if needed. There is so much more to safety now than just compliance. You need to constantly track where you are and what you want to differently, but annually at a minimum it needs to be refreshed. Look at the changes you want, what is the next evolution and never being satisfied with the results, regardless of where you are. The minute you are satisfied, that is when things will start to revert to the old ways. Your players in the facility change all the time and this has to be constantly driven from the top leadership. There is more work that needs to be done at those levels**.

10. What would you recommend for someone coming behind you? In other words, what would you do differently if you were just starting out?

Respondent #1: **In new safety professionals, there is a heavy emphasis to read, understand and investigate regulations. Very compliance-based approach. We give them a foundation of that and after a while it almost becomes a heuristic that safety and compliance are the same thing. It is making it hard for new ideas to be injected in the market. I would not be getting people with safety degrees but more so in the social sciences and learning about how people operate in systems and what are the leverage points for improving that process. That is a huge gap in that we focus on the technical aspects of the profession and don't give them tools on the social side. And not just in interacting with people, that is also a gap. That is a fundamental principle of Safety-II - understanding how social systems work in a complex environment. How do people adapt to achieve success?**

We don't equip safety people with that at all and we need to, we need to think about if we implement a new procedure, how do I critically think about how this will affect the process. That is a huge disability for our profession.

Respondent #2: **Read more, lot of great stuff out there. Look out there, read and think, consciously focus on how we see the worker colors how we manage this program. Listen for victim language and "they are bad" and move people beyond that. Ultimately, the next great safety leaders in our world aren't thinking about safety they are running devops, Artificial Intelligence or driverless cars, they are people that understand systems and complexity. That is the direction I think our thinking is going to go and that is cool**.

Respondent #3: **One of the big mistakes we made when we did this in Australia was we were inventing tools and as soon as we did we put them out for the business to use, unfortunately without a good understanding of what to do with them in a safety differently environment. New tools used in an old environment. We would find that a planning tool would be used as checklist and an appreciative investigations that would focus on success, would still look at what broke, what rules weren't followed and who do we need to get rid of? Make sure that you spend enough time to build the philosophical case for doing what you do is important. One of the things we did here in Europe was we deliberately withheld the tools from the business for twelve months. There's a real appetite for getting out there, but you need to understand why we are doing this. Also, I think the bottom up approach is good and another piece of advice is to be a lot braver than we were. There is a lot of**

appetite for doing it this way. I think we could have pushed a little bit harder and faster than we did.

Respondent #4: **Understanding the relationship that my office has with the organization – which is organizational learning and human performance. I thought of my job as support function but it is actually as a translator so that field and leadership and vice versa can talk to each other, and this is how we build the bridges in order to improve safety**.

Respondent #5: **Environmental was where I first started in 1980, at that time, it was one thing, but now it has evolved to air, water, remediation, compliance, sustainability and many other domains. It is time for safety to do the same. There are those that need to focus on technical safety, but you need also to be an organizational coach and to build in yourself to acquire that knowledge. You must learn uncommon knowledge to be able to do this, but this is where the future will go. I believe the safety profession will begin to specialize like environmental has**.

Respondent #6: **The first one is to learn the organization more in depth. I wanted to make a positive impression and hit the ground running when I started. Building relationships is the most important thing. I would concentrate less on the data and more on those proactive conversations and finding ways to start them. Not the short ones that are forgotten in a week or two, but conversations that build upon the long term conversation**

and keep building so it keeps continuing and it is prolonged and routine and we have them on a regular basis.

Respondent #7: **In terms of Safety-II, you have to keep learning the concepts. Some of these are not even reachable by someone who has spent the last 4 years in a classroom – especially someone who is grounded mostly in the regulations and that doesn't necessarily set people up for success in this field. People have to make sense of the world and you have to be ready for the information before it gets put in front of you, especially in terms of Safety-II. How do you get people interested in this before they are totally indoctrinated in the regulatory aspect of this profession? One way is to require a developmental or industrial psychology class so that they can understand how people see the world and their difference and how they respond in the workplace in order to put these concepts in front of people earlier**.

Respondent #8: **One thing is study like crazy and learn as much as you can. If I would have spent my first consulting year learning from people around the world, it would have put me way ahead. Safety people are usually in crisis management and don't have time to read and think. One of the challenges for us is how do we create tools and materials that can help others on the journey without them having to read and have limited time. Podcasts, and professional journal articles are good examples**.

Respondent #9: **For someone new in this domain, educate yourself and start at the beginner level and one of the best is James Reason's book *Managing the Risks of***

Organizational Accidents. **And an excellent follow on book by him is entitled *Organizational Accidents Revisited,* where he does a re-buff of the proponents of resilience engineering. Also you have to make sure that management takes responsibility for human and organizational performance. This is not the safety and health person's responsibility. It's management's responsibility for not only what's happening in the workplace, but for their systems. The fundamental causes of any incident is within the system, not with the worker. It is most important that managers understand that accountability is for them and they are held accountable for managing the risk (the critical steps) and for systems learning. They're not living problems. I like Steven Spears' book *The High Velocity Edge*, he makes the point you don't live with problems, you fix problems. In the commercial nuclear industry, they have what are called FIN teams (Fix It Now). If there is some kind of workplace problem that can be resolved without planning, then go ahead and fix it and don't live with it. As long as you have these equipment, resource or administrative problems then you have time at risk. You need to help your managers recognize that you are setting your organization up for failure if you live with these. I would also help managers know how to do positive reinforcement. They need to know what behaviors they want out of their workforce, supervisors, and staff – and reinforce those. They need to know how their organization influences desired behaviors and at the same time know how they influence undesired or unwanted behaviors. For someone just starting out, they need to understand how the organization works to influence people's choices. I'm a big proponent of Dave Marx's work and he wrote a book called *Whack a Mole* and *Dave's Subs* and it's all about accountability. How do you hold people accountable? You have to have a reason how you adjudicate performance. This is why I targeted managers as my primary**

audience is that fundamentally, what's happening in the workplace is because of management. They don't like to be told that – that if the worker would just follow procedures. Helping managers understand how their systems work to create performance and outcomes is a huge part of the equation.

Respondent #10: **To prepare for difficulties when presenting this message. The barriers, roadblocks and un-acceptance instead of just saying this is what we're going to do. I was no longer in the military and didn't have that ability to just make it happen. It was met with resistance and I should have expected pushback. Safety-II is a real unorthodox way of thinking about things. I think the immediate satisfaction of who did it and getting rid of someone who may be at fault doesn't fix anything. It just covers it up and it's going to happen again to the next person. So moving from the "blame and shame" to the "learn and improve" model was very difficult. But it is taking hold, slowly but surely. It is extremely important to understand that behavior is based from a culture and an environment of the system. You can do whatever you want to do to change it and people will adapt to their environment regardless of what it is. If you take someone out of their environment they will adapt and survive. That is the same way we run our organizations here. So stop trying to fix the person and fix the environment. The people will follow. There is your black line/blue line and the gap between them is to create that environment where it is conducive to say this isn't really working. So let's try and change it. Try-storm it and see if it works. That's the only way I know to make it better**.

Respondent #11: **Not sure I would do anything that different but would spend as much time as possible at the sharp end. No time spent at the sharp end is wasted. So spend as much time as possible building relationships and as little time as necessary in the office**.

Respondent #12: **One thing I talk about now is having the courage to speak up. You have to have people openly talking about safety. The term I use during employee orientations is to have a culture is that we are all safety people and we expect you to look after your coworker – to make sure they have their PPE on for example. We need them all to help. You have to have a really strong tone that we are all empowered and that is critical. They have to take care of each other. For someone coming behind me, I would tell them communicate, communicate, communicate, listen, listen, and listen. These are the six most important words I can think of**.

Respondent #13: **You need to spend as much time out on the production floor as you possibly can when you're new. You need to understand what is going on and what the hazards are. You need to get to know the people out there and they need to get to know you. You want people to be comfortable approaching you. You have to build a relationship with everyone and an open door policy to gain their trust. This is especially true with the subject matter experts in the facility who will give you an honest appraisal of how something actually works. You have to rely on their help**.

11. Are there others that you recommend who have enjoyed success implementing Safety-II? Where "No additional contacts requested" is stated, the author had already obtained a sufficient number of candidates by the time the interview was conducted.

    Respondent #1: **Provided the author with one additional contact**.

    Respondent #2: **Provided the author with one additional contact**.

    Respondent #3: **Provided the author with three additional contacts**.

    Respondent #4: **Provided the author with two additional contacts.**

    Respondent #5: **Provided the author with two additional contacts**.

    Respondent #6: **No additional contacts requested**.

    Respondent #7: **Provided the author with no new contacts, but reinforced several of those already being interviewed**.

    Respondent #8: **No additional contacts requested**.

    Respondent #9: **No additional contacts requested**.

    Respondent #10: **No additional contacts requested**.

    Respondent #11: **No additional contacts requested**.

    Respondent #12: **No additional contacts requested**.

    Respondent #13: **No additional contacts requested**.